3.14 Hydrology and Water Resources

This section describes the environmental setting (regulatory setting and existing conditions) for hydrology and water quality relating to the proposed project, the impacts on hydrology and water quality that would result from implementation of the HST system, and mitigation measures that would reduce these impacts[1].

3.14.1 Regulatory Requirements and Methods of Evaluation

A. REGULATORY REQUIREMENTS

Several federal and state laws regulate and protect hydrologic resources, floodplains, and water quality. Below is a list of these statutes.

<u>Federal Laws and Regulations</u>

Clean Water Act (33 U.S.C. § 1251 et seq.)
The purpose of the CWA is restoration and maintenance of the chemical, physical, and biological integrity of the nation's waters through prevention and elimination of pollution. The CWA applies to discharges of pollutants into waters of the United States. The State Water Board is the state agency with primary responsibility for implementation of state and federally established regulations relating to hydrology and water quality issues. Typically, all regulatory requirements are implemented by the State Water Board through the nine different RWQCBs established throughout the state. The CWA operates on the principle that any discharge of pollutants into the nation's waters is prohibited unless specifically authorized by a permit; permit review is the CWA's primary regulatory tool. The following CWA sections are most relevant to this analysis.

Section 404 Permit for Fill Material in Waters and Wetlands
CWA Section 404 regulates the discharge of dredged and fill materials into *waters of the United States*, which include oceans, bays, rivers, streams, lakes, ponds, and wetlands. Refer to Section 3.15, "Biological Resources and Wetlands," for further discussion.

Section 402 NPDES Program
CWA Section 402 regulates discharges to surface waters through the NPDES program, administered by the EPA. In California, the State Water Board is authorized by the EPA to oversee the NPDES program through the RWQCBs (see related discussion under *Porter-Cologne Water Quality Control Act* below). The NPDES program provides for both general permits (those that cover a number of similar or related activities) and individual permits. Most construction projects that disturb 1 ac (0.4 ha) of land or more are required to obtain coverage under the NPDES General Permit for Construction Activities (General Construction Permit), which requires the property owner to file a NOI to discharge stormwater and to prepare and implement a Storm Water Pollution Prevention Plan (SWPPP). The SWPPP includes a site map and a description of proposed construction activities, along with demonstration of compliance with relevant local ordinances and regulations. The SWPPP must also describe the project-specific BMPs that will be implemented to prevent or reduce the discharge of construction-related pollutants, including sediments, into stormwater runoff and surface drainage. Permittees are required to conduct monitoring and reporting to ensure that BMPs are correctly implemented and effective in controlling the discharge of construction-related pollutants into stormwater runoff.

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[1] See Section 3.0, Introduction, for an explanation of how this section fits together with the HST Network Alternatives presented in Chapter 7, as well as for an overview of the information presented in the other chapters.

Section 401 Clean Water Quality Certification
Under CWA Section 401, applicants for a federal license or permit to conduct activities that may result in the discharge of a pollutant into waters of the United States must obtain certification from the state in which the discharge would originate, or, if appropriate, from the interstate water pollution control agency with jurisdiction over affected waters at the point where the discharge would originate. Therefore, all projects that have a federal component and may affect the quality of the state's waters (including projects that require federal agency approval, such as issuance of a Section 404 permit) must also comply with CWA Section 401. Section 401 certification or waiver is under the jurisdiction of the applicable RWQCBs.

Section 10 of the Rivers and Harbors Act (33 U.S.C. 401 *et seq.*)
Section 10 of the Rivers and Harbors Act, administered by the USACE, requires permits for all structures, such as riprap, and activities, such as dredging, in navigable waters of the United States. Refer to Section 3.15, "Biological Resources and Wetlands," for further discussion.

Executive Order 11988—Floodplain Management (U.S. DOT Order 5650.2; 23 C.F.R. 650, Subpart A)
Executive Order (EO) 11988 directs all federal agencies to avoid to the extent practicable and feasible all short-term and long-term adverse impacts associated with floodplain modification and to avoid direct and indirect support of development within 100-year floodplains whenever there is a reasonable alternative available.

Projects that encroach upon 100-year floodplains must be supported with additional specific information. The U.S. Department of Transportation Order 5650.2, *Floodplain Management and Protection*, prescribes "policies and procedures for ensuring that proper consideration is given to the avoidance and mitigation of adverse floodplain impacts in agency actions, planning programs and budget requests." The order does not apply to areas with Zone C (areas of minimal flooding as shown on Federal Emergency Management Agency [FEMA] Flood Insurance Rate Maps [FIRM]). Environmental review documents should indicate potential risks and impacts from proposed transportation facilities.

Flood Disaster Protection Act (42 U.S.C. 4001–4128; DOT Order 5650.2, 23 C.F.R. 650 Subpart A; and 23 C.F.R. 771)
The purpose of the Flood Disaster Protection Act is to identify flood-prone areas and provide insurance. The act requires purchase of insurance for buildings in special flood-hazard areas. The act is applicable to any federally assisted acquisition or construction project in an area identified as having special flood hazards. Projects should avoid construction in, or develop a design to be consistent with, FEMA-identified flood-hazard areas.

State Laws and Regulations

Porter-Cologne Water Quality Act (Water Code § 13000 et seq.)
The Porter-Cologne Water Quality Control Act, passed in 1969, articulates with the federal CWA (see the *Clean Water Act* section above). It established the State Water Board and divided the state into nine regions, each overseen by an RWQCB. The State Water Board is the primary state agency responsible for protecting the quality of the state's surface and groundwater supplies, but much of its daily implementation authority is delegated to the nine RWQCBs, which are responsible for implementing CWA, Sections 401, 402, and 303(d). In general, the State Water Board manages both water rights and statewide regulation of water quality, while the RWQCBs focus exclusively on water quality within their regions.

Three of the RWQCBs have jurisdiction over the water allocation and water quality in the area impacted by the HST (Central Coast RWQCB, Central Valley RWQCB, and the San Francisco RWQCB). See Appendix 3.14-B for a description of the RWQCBs.

There are a number of local regulatory and permitting agencies, such as flood control districts, irrigation districts, and water districts, that may have facilities that are affected by the project. These districts have different responsibilities to their customers but generally are required to provide drinking water, flood control, or irrigation water and administer local agreements regarding the quality and quantity of water delivered.

Dewatering Activities

On June 18, 2002, the Central Valley RWQCB (CVRWQCB) adopted Order No. 5-00-175, NPDES Permit No. CAG995001 (General Dewatering Permit). This general NPDES permit covers the discharge to waters of the United States of clean or relatively pollutant-free wastewater that poses little or no threat to water quality. The following categories are covered by this order: well development water, construction dewatering, pump/well testing, pipeline/tank pressure testing, pipeline/tank flushing or dewatering, condensate discharges, water supply system discharges, and miscellaneous dewatering/low threat discharges. This would apply to the HST system if there were use of a sheet pile cofferdam in any water body construction that would require dewatering. It could also apply to the proposed project for the use of simple wash water construction dewatering.

The districts in the project area include:

- Alameda County Flood Control and Water Conservation District.
- Central California Irrigation District.
- Del Puerto Water District.
- Grassland Water District.
- Merced Irrigation District.
- San Benito County Water District.
- San Joaquin River Group Authority.
- San Francisco Public Utilities Commission.
- San Luis and Delta-Mendota Water Authority.
- San Mateo County Department of Public Works.
- Santa Clara Water District.
- The Santa Clara Valley Urban Runoff Pollution Prevention Program.

See Appendix 3.14-B for a comprehensive description of each one of these local districts.

Basin Plans and Water Quality Objectives

The Porter-Cologne Act provides for the development and periodic review of basin plans that designate beneficial uses of California's major rivers and groundwater basins and establish narrative and numerical water quality objectives for those waters. Beneficial uses represent the services and qualities of a water body (i.e., the reasons why the water body is considered valuable), while water quality objectives represent the standards necessary to protect and support those beneficial uses. Basin plans are primarily implemented by using the NPDES permitting system to regulate waste discharges so that water quality objectives are met (see discussion of the NPDES system in the *Clean Water Act* section above). Basin plans are updated every 3 years and provide the technical basis for determining waste discharge requirements and taking enforcement actions. Basin plans are adopted and amended by the RWQCBs for all nine regions.

Cobey-Alquist Flood Plain Management Act (Water Code § 8400 *et seq.*):
The California Reclamation Board provides policy direction and coordination for the flood control efforts of state and local agencies along the Sacramento and San Joaquin Rivers and their tributaries in cooperation with USACE. The board cooperates with various federal, state, and local government agencies in establishing, planning, constructing, operating, and maintaining flood-control works. The California Reclamation Board also exercises regulatory authority to maintain the integrity of the existing flood-control system and designated floodways by issuing permits for encroachments.

California Department of Fish and Game Code (§ 1601–1603 [Streambed Alteration])
Under Sections 1601–1603 of the Fish and Game Code, agencies are required to notify the CDFG prior to implementing any project that would divert, obstruct, or change the natural flow or bed, channel, or bank of any river, stream, or lake.

B. METHOD OF EVALUATION OF IMPACTS

Impact Evaluation

Potential impacts on surface hydrologic resources, floodplains, and surface water quality were evaluated using a combination of both qualitative and quantitative assessment methods. The existing conditions described for the No Project Alternative provide the primary basis of comparison.

Potentially direct impacts are defined by the area within 50 ft total width of all alignment segments that have two tracks and 100 ft total width for segments that have four tracks (e.g., station location option areas and shared use corridors like Caltrain).

Indirect impacts may include such downstream effects as sedimentation, turbidity, impacts to water-dependent species, changes in flow-rate, erosion due to run-off, and ponding due to changes in flood flows. These impacts typically occur outside of the project footprint. Without project-level detail, it is difficult to identify specific locations for indirect impacts. Therefore, potential indirect impacts for hydrology and water quality are defined by the area within 200 ft total width of the entire alignment alternative regardless of if there are two tracks, four tracks, and/or station location options**.**

Potential tunnel impacts on hydrology and water resources were estimated from known information for groundwater and underground streams. These impacts, in addition to potential impacts from streams aboveground, were identified and discussed qualitatively.

Qualitative Assessment

A qualitative assessment was used to compare the alignment alternatives when discussing issues such as runoff rates, sedimentation, or other items that would ultimately require a more detailed analytic approach (i.e., at the project level) than appropriate for a program-level analysis. This also includes a description of the number and name (if available) of the water resources each alignment alternative would cross and therefore potentially impact. The number and names of water resources were determined using three different sources of information: northern and southern California atlases, aerial images, and GIS data files. Not all water resources identified have names, and therefore placeholders for unnamed canals or unnamed creeks were used.

Quantitative Assessment

For the quantitative assessment, readily available information on wetland areas, stream locations, existing water quality problem areas, flood zones, and general soil information was used to estimate the magnitude of the potential areas of direct and indirect impacts for the HST Alignment Alternatives. The following steps were followed to estimate the potential areas of impact for floodplains and water quality.

- Acreage of Special Flood Hazard Areas, as defined by FEMA on Flood Insurance Rate Maps, in the study area was identified and estimated to evaluate the area of floodplain potentially affected by project alternatives (Federal Emergency Management Agency 2007).
- Acreage of surface waters (lakes) and the linear feet of surface waters (rivers and streams) in the study area was estimated, using U.S. Geological Survey (USGS) 1:24,000 scale digital line graphs of blueline streams, including ephemeral streams as mapped. The linear feet of surface water was calculated based on the width of the HST crossing of rivers, streams, and canals in the study area. (U.S. Geological Survey 2006; U.S. Geological Survey with U.S. Environmental Protection Agency 2006; and U.S. Bureau of Reclamation 2005.)
- Waters with impaired water quality, i.e., waters included on the Section 303(d) CWA list distributed by the State Water Board, in the study area were identified along with the impairment (pollutant/stressor) and an indication of whether the impairment has the potential to be further affected by the proposed project. State GIS data from 2002 and 2006 TMDL description data were used to determine the location of the impaired segment and the type of pollutants causing the impairment. The 2006 description data was cross-checked with 2002 descriptions in the GIS files to ensure no duplicity or missing information (State Water Resources Control Board and Regional Water Quality Control Boards 2003).
- Acreage of areas of potential soil erosion in the study area was estimated to evaluate areas potentially affected by the project alternatives. The location of the potential erosive conditions was identified as those areas with a combination of erosive soils and high slopes, evaluated as the product of *kfact* and *slopeh* (listed in STATSGO data). Those conditions where kfact multiplied by slopeh is greater than 3.0 are potentially susceptible to soil erosion, and acreage of these areas within the study area was determined. This information was used to estimate potential erosion and sedimentation characteristics of the project area (U.S. Department of Agriculture, Natural Resource Conservation Service 2006).
- Acreage of groundwater was calculated using “Ground Water Basins” (Department of Water Resources, Division of Mines and Geology 2000).

Other sources used in calculating hydrology and water resources impacts include the following:

- California Department of Resources 2005.
- DeLorme 2003a and b.
- State Water Resources Control Board 2002a, b, c, d, e, and f.

C. CEQA SIGNIFICANCE CRITERIA

Under CEQA, a project may have a significant impact on hydrology and water quality if it would:

- Violate any water quality standards or waste discharge requirements.
- Substantially deplete groundwater supplies or interfere substantially with groundwater recharge, resulting in a net deficit in aquifer volume or a lowering of the local groundwater table level (e.g., the production rate of pre-existing nearby wells would drop to a level that would not support existing land uses or planned uses for which permits have been granted).
- Substantially alter the existing drainage pattern of the site or area, including through the alteration of the course of a stream or river, in a manner that would result in substantial erosion or siltation on site or off site.
- Substantially alter the existing drainage pattern of the site or area, including through the alteration of the course of a stream or river, or substantially increase the rate or amount of surface runoff in a manner that would result in flooding on site or off site.

- Create or contribute runoff water that would exceed the capacity of existing or planned stormwater drainage systems or provide substantial additional sources of polluted runoff.
- Otherwise substantially degrade water quality.
- Place within a 100-year flood hazard area structures that would impede or redirect flood flows.
- Expose people or structures to a significant risk of loss, injury, or death involving flooding, including flooding as a result of the failure of a levee or dam.

3.14.2 Affected Environment

A. STUDY AREA DEFINED

<u>Direct Impacts</u>

The potential direct impact study area is defined by the number of tracks of an HST Alignment Alternative and the presence of proposed new station facilities. This methodology allows for a larger area of analysis where the alignment alternative has a greater potential to affect the environment (i.e., is wider with more tracks). For alignment alternatives with two tracks, the area analyzed for direct impacts is 50 ft wide (25 ft on either side of the centerline of the alignment). For alignment alternatives with four tracks and/or proposed new station facilities, the area analyzed for direct impacts measures 100 ft in width (50 ft on either side of the centerline of the alignment alternative).

<u>Indirect Impacts (Potentially Affected Area)</u>

The potential indirect impact study area for hydrology and water quality is defined as the area within 200 ft (100 ft of either side of the centerline) of all alignment alternatives and station location options. This area is in addition to and does include the direct impact study area described above. Potential tunnel impacts on hydrology/water resources were also considered using known information for groundwater and underground streams.

<u>Topography and Climate</u>

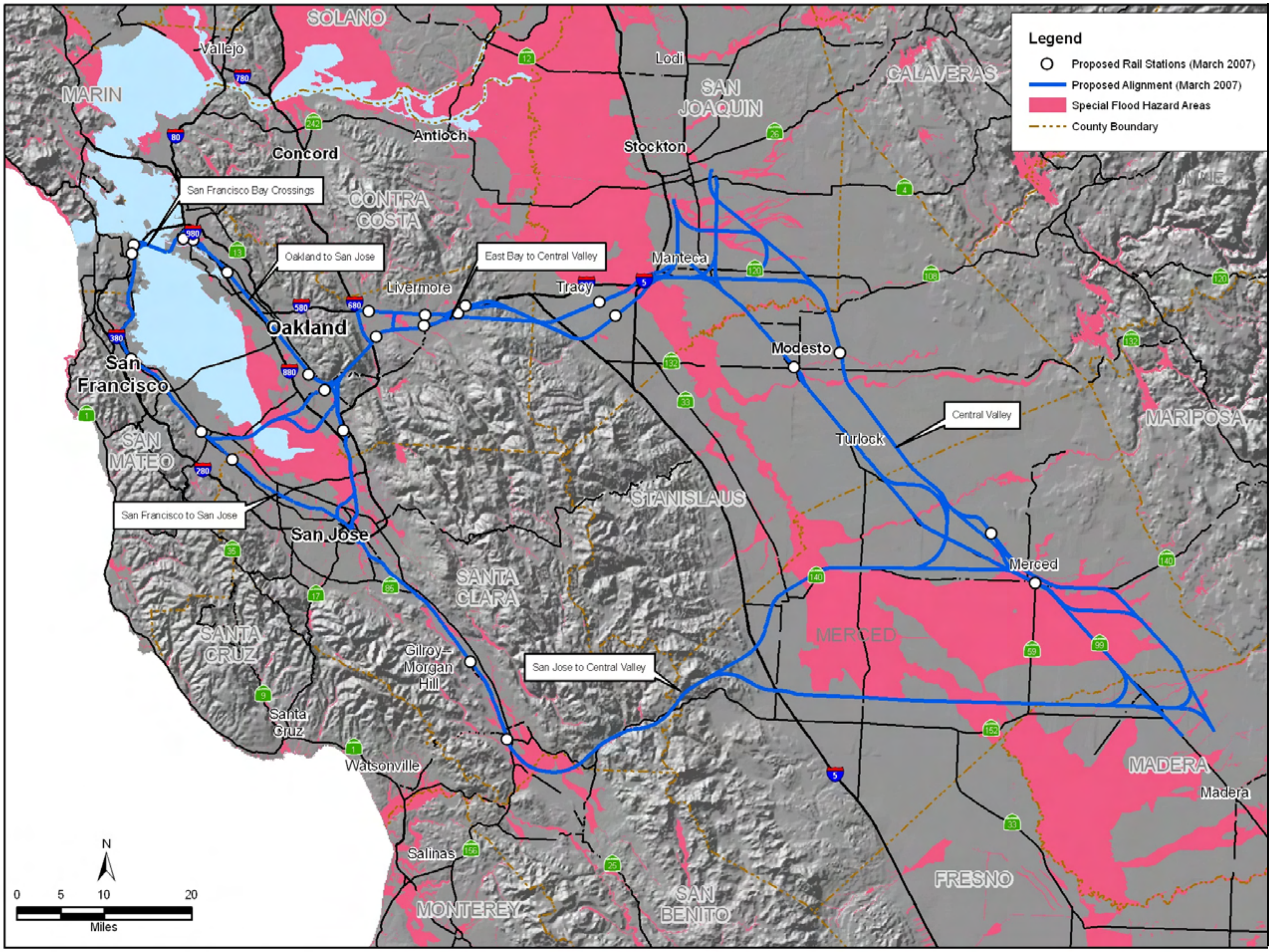
The topography of the hydrology study area ranges from flat coastal and valley areas to mountain ranges, as discussed in Section 3.13, "Geology and Soils." On average, about 75% of California's annual precipitation falls between November and March; 50% occurs between December and February. Northern California is much wetter than southern California, with more than 70% of California's average annual precipitation and runoff occurring in the northern part of the state (California Department of Water Resources 2003).

B. GENERAL DISCUSSION OF HYDROLOGY AND WATER RESOURCES

<u>Floodplains</u>

Floodplains are lands next to a river that are inundated by water when the river overflows its banks. FEMA designates and maps floodplains. In support of the National Flood Insurance Program (NFIP), FEMA has undertaken flood hazard identification and mapping to produce Flood Hazard Boundary Maps, Flood Insurance Rate Maps (FRIMs), and Flood Boundary and Floodway Maps. The zone of interest for the analysis of hydrologic resources in this program-level evaluation is defined as a special flood hazard area (SFHA) or Zone A, which is the flood insurance rate zone that corresponds to the 100-year flood hazard area in the hydrologic resource study area. Figure 3.14-1 shows SFHAs in the general vicinity of the hydrologic resources study area.

Floodplains are important because they provide floodwater storage and attenuate the risk of downstream flooding, provide important habitat for native species (discussed in Section 3.15, "Biological Resources and Wetlands"), improve water quality by allowing filtration of sediments and other contaminants, and may provide locations for groundwater recharge.



SOURCE: ESRI Streetmap USA (2005), California High Speed Rail Authority (2007), FEMA (2004)

Figure 3.14-1
Bay Area to Central Valley Floodplains

Floodplains encompass floodways, which are the primary areas that convey flood flows. Floodways are typically channels of a stream, including any adjacent areas. NFIP has introduced the concept of floodways and floodplains to assist local communities in floodplain management. The floodway is the channel of a stream, including any adjacent floodplain areas that must be kept free of encroachment so that the 100-year flood can be carried without substantial increases to flood heights. The area between the floodway and the 100-year floodplain boundary is referred to as the floodway fringe. Any approved encroachment may take place within the floodway fringe. According to guidelines established by FEMA, increase in flood height in the floodway due to any encroachment in the floodway fringe areas may not exceed 12 in (30.48 cm), provided that hazardous velocities are not produced in the water body. Constructing levees, rail and road embankments, buildings, etc., that encroach on floodplains may reduce the flood-carrying capacity and increase flood elevations.

Surface Waters

For this analysis, surface waters include improved flood control or drainage channels, canals, intermittent river and stream channels, permanent river and stream channels, ponds, lakes, reservoirs, coastal estuaries and lagoons, and sloughs. In addition, other human-made water features include aqueducts and salt evaporating ponds.

The California State Water Project (SWP) is a water storage and delivery system of reservoirs, aqueducts, power plants, and pumping facilities. Its main purpose is to store water and distribute it to urban and agricultural water suppliers in northern California, the San Francisco Bay Area, the San Joaquin Valley, the central coast, and southern California. The SWP includes about 660 mi (1,062 km) of open canals and pipelines.

The federal Central Valley Project (CVP) is a long-term project for the storage and delivery of waters of the Sacramento River basin in the north for use in the San Francisco Bay area, the farmlands of the San Joaquin Valley, and other metropolitan areas in the south.

The CVP's primary purposes include flood control; improvement of navigation on Central Valley rivers; development of hydroelectric power, irrigation, and municipal and industrial water supply; protection of the Sacramento-San Joaquin River Delta from salt water intrusion by allowing sufficient delivery of freshwater to the Delta; and protection and enhancement of fish and wildlife.

Streams and lakes are important because they support fish and wildlife, contribute to the water supply, convey floodwaters, and may contribute to or attenuate the risk of downstream flooding. They provide important habitat for native species and may support wetland and riparian habitats (discussed in Section 3.15, "Biological Resources and Wetlands"), direct pathways connecting to downstream ecological or human resources, and locations for groundwater recharge.

Lagoons and estuaries are sheltered, semi-enclosed, brackish bodies of water along shorelines where fresh water and saltwater interface through tidal flows and currents. Pollution from stormwater runoff, industrial discharges, and boats can damage these resources, especially if their tidal flow is limited. The amount, frequency, duration, and quality of freshwater flows affect the salinity levels, which in turn dictate the types of biological resources associated with a particular water body. Figure 3.14-2 shows surface waters in the general vicinity of the hydrologic resources study area. (See Section 3.15, "Biological Resources and Wetlands," for a discussion of wetlands).

Groundwater

Groundwater is found in subsurface water-bearing formations. A groundwater basin is defined as a hydrogeologic unit containing one large aquifer or several connected and interrelated aquifers. Groundwater basins, which do not necessarily coincide with surface drainage basins, are defined by surface features and/or geological features such as faults, impermeable layers, and natural or artificial divides in the water table surface. The elevation of groundwater varies with the amount of withdrawal and the amount of recharge to the groundwater basin. Groundwater basins may be recharged naturally as precipitation infiltrates and/or artificially with imported or reclaimed water. Shallow groundwater is subject to potential impacts from dewatering during construction.

Figure 3.14-3 shows groundwater basins within the general vicinity of the hydrologic resources study area.

C. GENERAL DISCUSSION OF WATER QUALITY

Surrounding land uses affect surface water and groundwater quality. Both point-source[2] and nonpoint-source[3] discharges contribute contaminants to surface waters. Pollutant sources in urban areas include parking lots and streets, rooftops, exposed earth at construction sites, and landscaped areas. Pollutant sources in rural/agricultural areas primarily include agricultural fields and operations.

The impacts of nonpoint-source pollutants on aquatic systems are many and varied. Polluted runoff waters can result in impacts on aquatic ecosystems, public use, and human health from ground and surface water contamination; damage to and destruction of wildlife habitat; decline in fisheries; and loss of recreational opportunities. Small soil particles washed into streams can smother spawning grounds and marsh habitat. Suspended small soil particulates can restrict light penetration into water and limit photosynthesis of aquatic biota. Metals and petroleum hydrocarbons washed off roadways and parking lots and fertilizers, pesticides, and herbicides from landscaped areas may cause toxic responses (acute or long-term) in aquatic life or may harm water supply sources such as reservoirs or aquifers.

Erosion

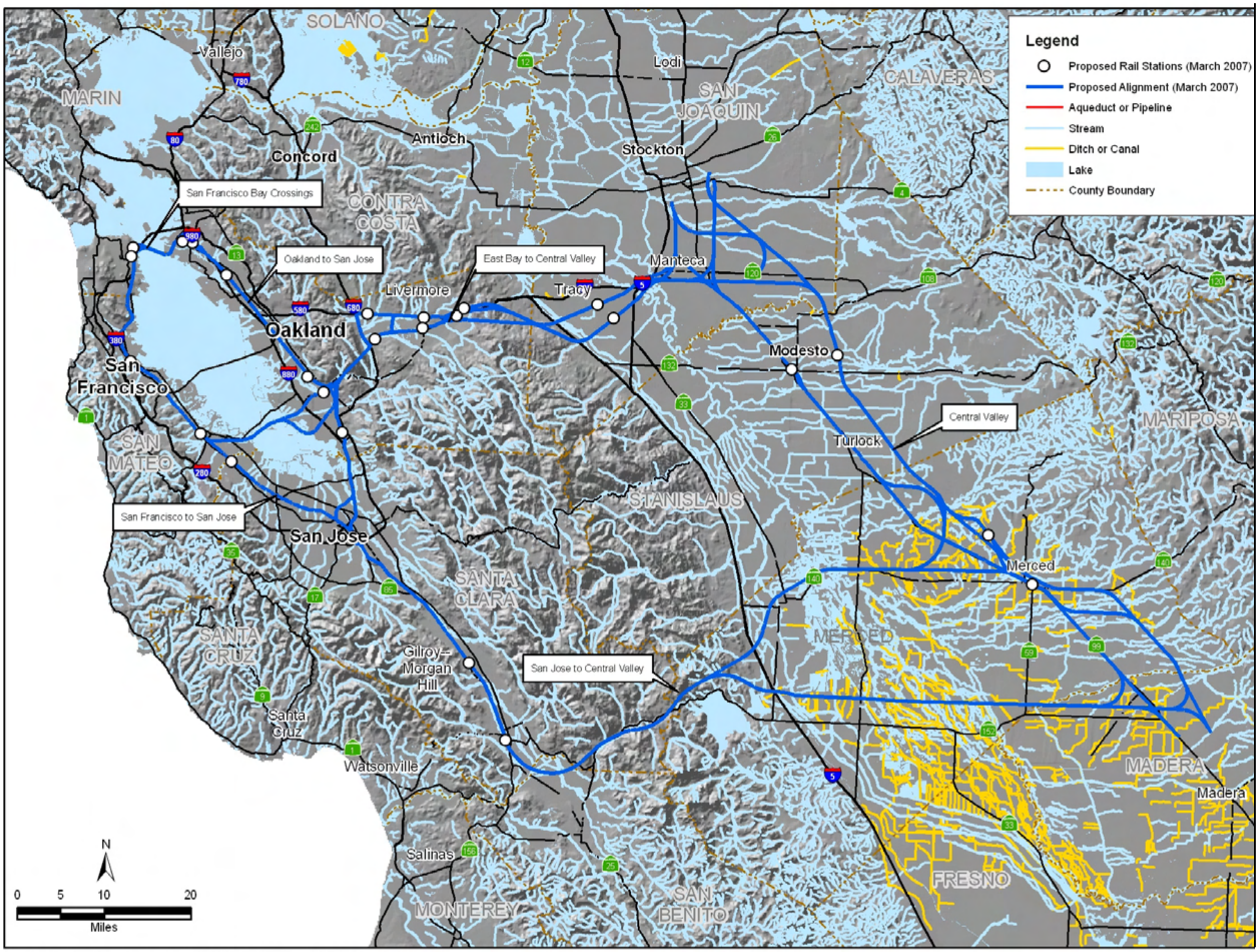
Potential impacts on water quality may result from construction activity (e.g., grading, which removes vegetation, exposing soil to wind and water erosion). A potential erosive condition occurs in areas with a combination of erosive soil types and steep slopes. Erosion can result in sedimentation that ultimately flows into surface waters. Contaminants in runoff waters may include sediment, hydrocarbons (e.g., fuels and solvents), metals, pesticides, bacteria, nutrients, and trash. Figure 3.14-4 shows areas with soils susceptible to erosion in the general vicinity of the hydrologic resources study area.

Impaired Waters

Some water bodies have been given special status under the CWA. The Section 303(d) list of CWA requires each state to identify waters that will not achieve water quality standards after application of effluent limits and to develop plans for water quality improvement. For each water body and pollutant for which water quality is considered impaired, the state must develop load-based (as opposed to concentration-based) limits called total maximum daily loads (TMDLs). TMDL is the maximum amount of pollution (both point and non-point sources) that a water body can assimilate without violating state water quality standards. Priorities for development of TMDLs are set by the state, based on the severity of the pollution and the beneficial uses of the waters. The EPA's TMDL program provides a process for determining pollution budgets for the nation's most impaired waters. Pollutant loading limits are set and implemented by the State Water Board under the Porter-Cologne Act. The program includes development of water quality standards, issuance of permits to control discharges, and enforcement action against violators.

[2] *Point source* is a stationary location or fixed facility, such as the end of a pipe, from which pollutants are discharged. (U.S. Environmental Protection Agency 2002.)

[3] *Nonpoint source* pollution is caused by rainfall moving over and through the ground. As the runoff moves, it picks up and carries away natural and human-made pollutants, finally depositing them into lakes, rivers, wetlands, coastal waters, and even underground sources of drinking water (U.S. Environmental Protection Agency 2002).



SOURCE: ESRI Streetmap USA (2005), California High Speed Rail Authority (2007), California Resources Agency (2003), US Bureau of Reclamation (2003)

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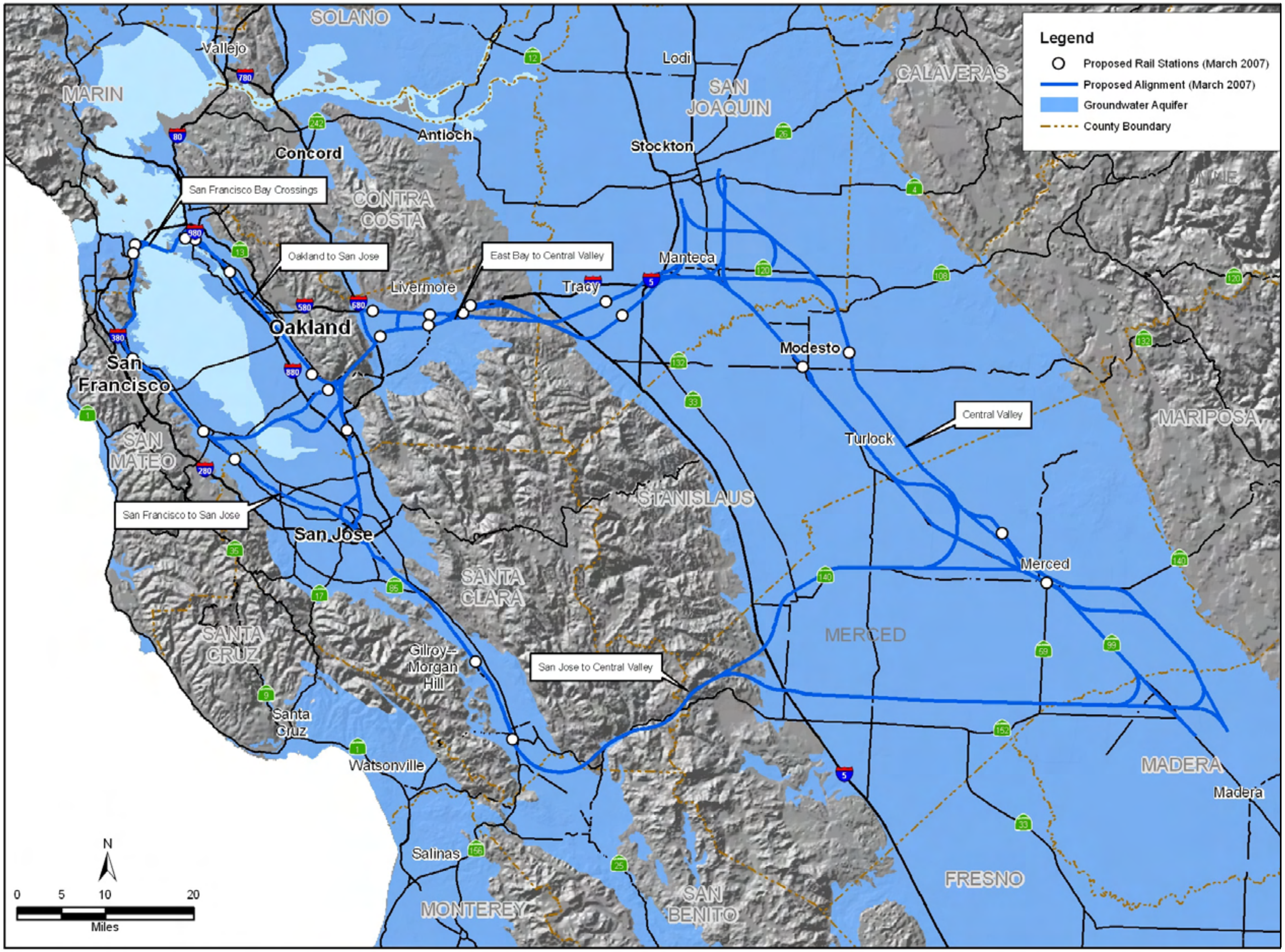
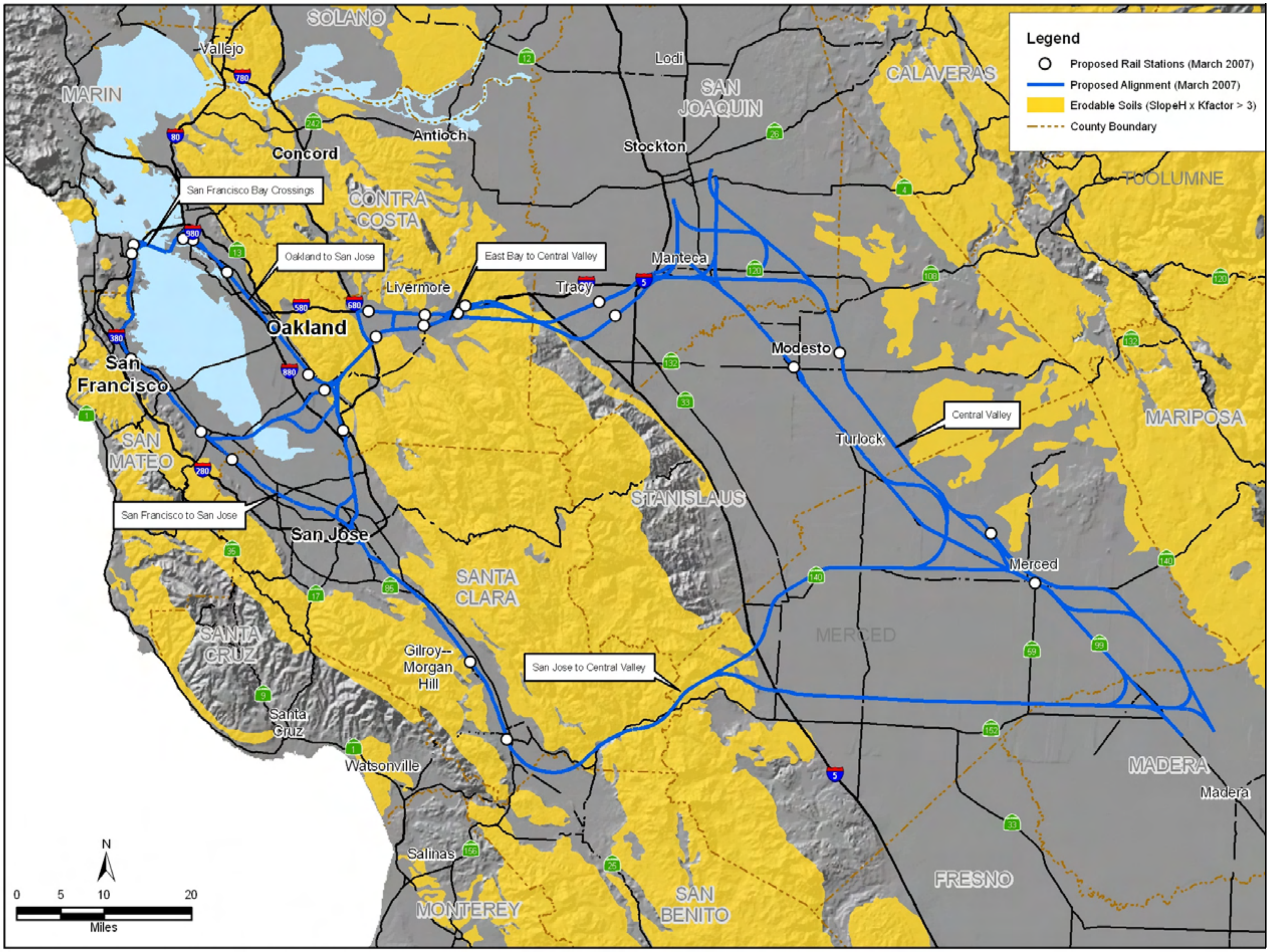
Figure 3.14-2
Bay Area to Central Valley Surface Waters



SOURCE: ESRI Streetmap USA (2005), California High Speed Rail Authority (2007), USGS (2000)

Figure 3.14-3
Bay Area to Central Valley Groundwater



SOURCE: ESRI Streetmap USA (2005), California High Speed Rail Authority (2007), USDA Natural Resources Conservation Service (2006)

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Figure 3.14-4
Bay Area to Central Valley Erodable Soils

D. HYDROLOGY/WATER RESOURCES AND WATER QUALITY OF THE STUDY AREA

This region includes central California from the San Francisco Bay area (San Francisco and Oakland) south to the Santa Clara Valley and east across the Diablo Range to the Central Valley and east across the Altamont Pass to the Central Valley.

San Francisco to San Jose Corridor

The San Francisco to San Jose corridor includes the western portion of the San Francisco Bay area from San Francisco (San Francisco County), south through eastern San Mateo County to San Jose (Santa Clara County). The San Francisco Bay and the Santa Clara Valley geophysical features dominate the areas traversed by this corridor. The major watershed that corresponds to these geophysical features is the San Francisco Bay watershed, including the Guadalupe River and Coyote Creek. Elevation along the San Francisco to San Jose corridor ranges from sea level to around 200 ft (61 m).

Floodplains
As delineated by FEMA, 100-year floodplains have been mapped along the streams bordering San Francisco Bay, along Coyote and Suisun Creeks, and along the Guadalupe River.

Surface Waters
Major streams and surface waters in the study area include San Francisco Bay and the Guadalupe River. The study area also includes extensive tidal flats and salt evaporating ponds in the South Bay and the estuaries of Coyote Creek and Guadalupe River. In addition, the Hetch Hetchy Aqueduct is a major water resource in this area.

Groundwater
Relatively uniform, unconfined aquifers and associated water tables are expected in the San Francisco Bay/Santa Clara Valley Basins to the west. The Santa Clara Valley Basin is composed of the Santa Clara Subbasin and the San Mateo Subbasin along this corridor. Additionally, there is the San Francisco sand dune area and the Visitation Valley Basin that provide groundwater. Groundwater in this basin is routinely pumped for domestic purposes and is subject to long-term fluctuations in water levels due to overdraft and recharge conditions. Groundwater is generally considered shallow in recharge/discharge areas near San Francisco Bay.

Oakland to San Jose Corridor

The Oakland to San Jose corridor includes the eastern portion of the San Francisco Bay Area from Oakland in Alameda County south through Fremont and Milpitas to San Jose. The San Francisco Bay, the Santa Clara Valley, and the Diablo Range are the geophysical features that dominate the areas traversed by this corridor. The major watershed that corresponds to these geophysical features is the San Francisco Bay watershed, including the Guadalupe River and Coyote Creek. Elevation along the Oakland to San Jose corridor ranges from sea level to around 200 ft (61 m).

Floodplains
As delineated by FEMA, 100-year floodplains have been mapped along the streams bordering and leading into San Francisco Bay.

Surface Waters
Major streams and surface waters in the study area in this region include San Francisco Bay, Oakland Harbor, San Leandro Bay, and San Leandro and San Lorenzo Creeks. The Sacramento, San Joaquin, and Merced Rivers empty into the bay delta, which ultimately discharges into San Francisco Bay. The study area also includes Lake Merritt Tidal Channel, Quarry Lakes, extensive tidal flats and salt evaporating ponds in the South Bay, and the estuaries of Coyote Creek and Guadalupe River.

Groundwater

The Santa Clara Valley Basin is the primary source for groundwater along this corridor with three of its subbasins: the Alameda East Bay, the Niles Cone, and the Santa Clara. Groundwater in these basins is routinely pumped for domestic uses and is subject to long-term fluctuations in water levels due to overdraft and recharge conditions. Groundwater is generally considered shallow in recharge/discharge areas near San Francisco Bay. Occurrence of groundwater in the Diablo Range would likely be influenced by fracture patterns and rock type.

San Jose to Central Valley Corridor

The San Jose to Central Valley corridor includes the Santa Clara Valley from San Jose south through Morgan Hill and Gilroy, and then east through the Coast Range into the Central Valley. The major geophysical regions include the Santa Clara Valley, the southern reaches of the Diablo Range, and the Central Valley. The major watersheds include the San Francisco Bay watershed, including the Guadalupe River and Coyote Creek, the Pajaro River watershed, and the San Joaquin River watershed. Elevation along the San Jose to Central Valley Corridor ranges from 150 ft (46 m) to 1,200 ft (366 m).

In addition, The GEA is located in the area of this corridor. The GEA, located north, east, and south of the city of Los Banos in Merced County, encompasses approximately 180,000 ac (72,843.71 ha). It is the largest wetland complex in California and contains the largest block of contiguous wetlands remaining in the Central Valley.[4] This region is considered a critical component of the Central Valley wintering habitat for waterfowl and has been recognized as a resource of international significance. Included in the GEA are the San Luis National Wildlife Refuge and the Kesterson National Wildlife Refuge.

Floodplains

As delineated by FEMA, 100-year floodplains have been mapped along the Pajaro River and its tributaries.

Surface Waters

Major streams and surface waters in the study area in this region include the Guadalupe, Pajaro, San Joaquin, Chowchilla, and Merced Rivers. The Hetch Hetchy and California Aqueducts, Don Castro and San Luis Reservoirs, and O'Neill Forebay are also located in the study area in this region. In addition, there are a number of managed wetland areas including Mud Slough, Salt Slough, Los Banos Wildlife Area, Kesterson National Wildlife Refuge, and Kesterson Reservoir. Many of the streams and creeks in this region are considered impaired waters. Orestimba Creek and the surrounding watershed has been designated as an aquatic resource of national importance. In addition, there are a number of manmade canals and channels that crisscross the Central Valley alignments.

Groundwater

Relatively uniform, unconfined aquifers and associated water tables are expected in the two valleys at either end of the proposed alignment alternatives, the Central Valley to the east and the San Francisco Bay/Santa Clara Valley to the west. In the Central Valley, the largest groundwater basin is the San Joaquin, composed of the Delta Mendota Subbasin, the Merced Subbasin, the Chowchilla Subbasin, and the Madera Subbasin along the HST corridor. In the San Francisco Bay/Santa Clara Valley, the largest groundwater basins are the Santa Clara Valley, composed of the Santa Clara Subbasin, and the Gilroy-Hollister Valley Basin, composed of the Bolsa Area and the Llagas Area. Groundwater in these basins is routinely pumped for domestic and agricultural purposes and is subject to long-term fluctuations in water levels due to overdraft and recharge conditions. Groundwater is generally considered shallow in recharge/discharge areas near the San Joaquin River

[4] Grasslands Water District, Land Use and Economics Study: Grasslands Ecological Area (July 2001), P. 2 (hereafter "Grassland Water District").

and its tributaries in the Central Valley, near San Francisco Bay, and in the area of the Sacramento-San Joaquin River Delta. Occurrence of groundwater in the Diablo Range would likely be influenced by fracture patterns and rock type.

East Bay to Central Valley Corridor

The East Bay to Central Valley corridor includes the East San Francisco Bay near Union City (Alameda County) east to the Livermore Valley (Pleasanton and Livermore), across Patterson Pass into the Central Valley. The dominant geophysical features traversed by this corridor include the San Francisco Bay, the Diablo Range, and the Central Valley. Major watersheds include the San Francisco Bay watershed, the Las Positas watershed, and the San Joaquin River watershed. Elevation along the East Bay to Central Valley corridor ranges from 100 ft (30 m) to 1,300 ft (396 m).

Floodplains
As delineated by FEMA, 100-year floodplains have been mapped along the San Joaquin River and its tributaries.

Surface Waters
Major streams and surface waters in the study area in this region include the San Joaquin River, the Delta Mendota Canal, and the California Aqueduct. There are a number of additional manmade canals and channels that crisscross the East Bay to Central Valley alignments.

Groundwater
Relatively uniform, unconfined aquifers and associated water tables are expected in the San Francisco Bay/Santa Clara Valley groundwater basins to the west. This corridor is composed of a number of groundwater basins, as well as subbasins, including the Santa Clara Valley Basin and the Niles Subbasin; the San Joaquin Valley Basin and the Eastern San Joaquin and Tracy subbasins; Livermore Valley Basin; and Sunol Valley Basin. Groundwater in this basin is routinely pumped for domestic and agricultural purposes and is subject to long-term fluctuations in water levels due to overdraft and recharge conditions. Groundwater is generally considered shallow in recharge/discharge areas near the San Joaquin River and its tributaries in the Central Valley, near San Francisco Bay, and in the area of the Sacramento-San Joaquin River Delta. Occurrence of groundwater in the Diablo Range would likely be influenced by fracture patterns and rock type.

San Francisco Bay Crossings

The San Francisco Bay Crossings study area includes the San Francisco Bay area from San Francisco east to Oakland and the San Francisco Bay area from North Fair Oaks (San Mateo County) east to Union City. The major geophysical feature traversed is the San Francisco Bay, which is the major watershed. Elevation ranges from sea level to 50 ft (15 m).

The San Francisco Bay is an estuary divided in to the South, Central, and North Bay. It has a deep central channel, broad mudflats, and fringing marsh. The combined flows of the Sacramento and San Joaquin watersheds flow through the Sacramento Delta and into the San Francisco Bay (Department of Water Resources 2005, page 3-1).

The immediate region is generally highly urbanized and includes the major cities of San Francisco, Oakland, and the San Jose Metropolitan area. Water use in the Bay region is predominantly urban with more than 50% of the use as residential (Department of Water Resources 2005, page 3-1). Although local groundwater only accounts for about 5% of the region's average water supply, the more heavily used basins include the Santa Clara Valley, Livermore Valley, Westside, Niles Cone, Napa-Sonoma Valley, and Petaluma Valley groundwater basins(Department of Water Resources 2005, page 3-3).

Because the estuary's watershed is highly urbanized, contaminant loads come from both nonpoint and point sources, including stormwater runoff, construction site runoff, pesticide and erosion from agricultural land runoff, discharges from refineries, ships discharging ballast water, waste, and other industrial uses. (Department of Water Resources 2005, page 3-4 and 3-9). The Napa, Petaluma, and Guadalupe Rivers; the Sacramento-San Joaquin Delta; and the Central Valley all contribute different pollutants to the estuary. Sediment concentrations of legacy pollutants (polychlorinated biphenyls, mercury, silver, and selenium) are a continuing problem in the estuary, with sediment samples passing toxicity tests only about 60 percent of the time (Department of Water Resources 2005, page 3-9).

Floodplains
As delineated by FEMA, 100-year floodplains have been mapped along the streams bordering San Francisco Bay. They also have been mapped along many of the rivers that empty into the Bay, such as Coyote and Suisun Creeks, and along the Guadalupe, Sacramento, San Joaquin, and Merced Rivers and their tributaries.

Surface Waters
Major streams and surface waters in the study area in this region include San Francisco Bay. The Guadalupe, Pajaro, Sacramento, San Joaquin, and Merced Rivers and their tributaries all discharge into San Francisco Bay. The study area also includes Lake Merritt Tidal Channel, Quarry Lakes, extensive tidal flats and salt evaporating ponds in the South Bay, and the estuaries of Coyote Creek and Guadalupe River. Many of the streams and creeks in this region are considered impaired waters.

Groundwater
Relatively uniform, unconfined aquifers and associated water tables are expected in the Santa Clara Valley Basin (Niles Cone and Alameda East Bay Subbasins). Groundwater in this basin is routinely pumped for domestic purposes and is subject to long-term fluctuations in water levels due to overdraft and recharge conditions. Groundwater is generally considered shallow in recharge/discharge areas near San Francisco Bay.

<u>Central Valley Corridor</u>

The Central Valley corridor includes the Central Valley from Chowchilla (Madera County) and Merced (Merced County) north through Modesto (Stanislaus County) to Stockton (San Joaquin County). The major geophysical feature traversed by this corridor is the Central Valley. The major watershed in this corridor is the San Joaquin River watershed. Elevation range for the Central Valley corridor ranges from 30 ft (9 m) to 250 ft to (76 m).

As with the San Jose to Central Valley corridor, the Central Valley corridor falls within the San Joaquin River watershed. Six drainages make up the west side of the valley floor section of the San Joaquin River. From north to south, they are Del Puerto Creek, Orestimba Creek, Garzas Creek, Los Banos Creek, Mud Slough, and Salt Slough. Many of these tributaries are under the control of the Westside San Joaquin Valley Drainage Authority, and flows are dictated by the land use of the area, which is primarily agricultural. Summer water flows are entirely composed of agricultural return flows.

Floodplains
As delineated by FEMA, 100-year floodplains have been mapped along the Sacramento, San Joaquin, and Merced Rivers and their tributaries.

Surface Waters
Major streams and surface waters in the study area in this region include the San Joaquin, Tuolumne, Stanislaus, Chowchilla, and Merced Rivers. The Hetch Hetchy and California Aqueducts, Don Castro and San Luis Reservoirs, and O'Neill Forebay are also located in the study area in this corridor. Many

of the streams and creeks in this corridor are considered impaired waters. In addition, there are a number of manmade canals and channels that crisscross the Central Valley.

Groundwater

Relatively uniform, unconfined aquifers and associated water tables are expected in the Central Valley groundwater basins to the east. The San Joaquin Valley groundwater basin encompasses this entire region, and the corridor impacts the following subbasins: Modesto, Eastern San Joaquin, Turlock, Merced, and Chowchilla. Groundwater in these basins is routinely pumped for domestic and agricultural purposes and is subject to long-term fluctuations in water levels due to overdraft and recharge conditions. Groundwater is generally considered shallow in recharge/discharge areas near the San Joaquin River and its tributaries in the Central Valley and in the area of the Sacramento-San Joaquin River Delta.

3.14.3 Environmental Consequences

A. NO PROJECT ALTERNATIVE

In addition to existing conditions, the No Project Alternative includes planned and programmed transportation improvements that would be constructed and operational by 2030. The potential impacts of the No Project Alternative on hydrologic resources and water quality are assumed to be limited because typical design and construction practices would need to meet permit conditions. However, some impacts on hydrologic resources would likely result from the implementation of the projects under the No Project Alternative, such as increased runoff from added lanes of paved surface and new columns for expanded bridges over rivers and streams. However, attempting to estimate these potential changes would be speculative. It is assumed that project-level environmental documents and permits would be prepared by project proponents for future projects that would affect hydrologic resources and water quality. These project-level documents would identify and analyze, and avoid, minimize, or mitigate potential impacts on hydrology and water quality to the extent feasible.

B. HIGH-SPEED TRAIN ALIGNMENT ALTERNATIVES

Potential impacts on hydrology and water resources that may result from the proposed HST Alignment Alternatives and station options include potential encroachment on or location in a floodplain, potential impacts on water quality, potential increased/decreased runoff and stormwater discharge due to changes in the amount of paved surfaces, potentially increased or decreased contribution of nonpoint-source contamination from automobiles, and potential impacts on groundwater from dewatering or reduction of groundwater recharge.

The key findings of the hydrology and water quality analysis by corridor and alignment alternative are summarized below. For a summary of the hydrologic and water quality potential direct impacts, see Table 3.14-1. Potential indirect impacts are listed in Table 3.14-2. For complete data of all hydrological and water quality impacts by alignment segment, see Appendix 3.14-A.

Table 3.14-1. Summary of Direct Water Resource Impacts for Alignment Alternatives and Station Location Option Comparisons

Corridor	Possible Alignments	Alignment Alternative	Floodplains (acres)	Streams (linear feet)	Lakes/ Bay (acres)	Erosion (acres)	Groundwater (acres)	Section 303d Waters Affected
San Francisco to San Jose: Caltrain	1 of 1	San Francisco to Dumbarton	49.3	1,178	0.0	8.5	268.0	1
	1 of 1	Dumbarton to San Jose	46.5	1,435	0.0	0.0	238.8	6
Station Location Options								
Transbay Transit Center			0	0	0	0	9.1	0
4^{th} and King (Caltrain)			0	0	0	0	40.6	0
Millbrae/SFO			0	0	0	0	11.0	0
Redwood City (Caltrain)			0	0	0	0	6.2	0
Palo Alto (Caltrain)			0	0	0	0	20.7	0
Oakland to San Jose: Niles/I-880	1 of 2	West Oakland to Niles Junction	4.3	1,035	0.0	12.6	133.2	3
		12^{th} Street/City Center to Niles Junction	4.3	1,035	0.0	12.6	132.1	3
	1 of 2	Niles Junction to San Jose via Trimble	36.4	1,013	0.7	22.5	143.2	3
		Niles Junction to San Jose via I-880	45.5	1,135	0.7	22.5	134.5	3
Station Location Options								
West Oakland/7th Street			0	0	0	0	5.1	
12th Street/City Center			0	0	0	0	4.8	0
Coliseum/Airport			1.61	1,683	0	0	15.1	0
Union City (BART)			1.12	273	0	0	56.0	0

Corridor	Possible Alignments	Alignment Alternative	Floodplains (acres)	Streams (linear feet)	Lakes/ Bay (acres)	Erosion (acres)	Groundwater (acres)	Section 303d Waters Affected
Fremont (Warm Springs)			0	0	0	0	81.3	0
San Jose to Central Valley: Pacheco Pass	1 of 1	Pacheco	103.4	2,674	0.0	41.8	451.0	5
	1 of 3	Henry Miller (UPRR Connection)	126.4	6,697	2.3	22.2	355.4	3
		Henry Miller (BNSF Connection)	130.4	6,266	2.5	22.2	366.9	3
		GEA North	53.08	6,771	2.3	36.0	340.3	3
Station Location Options								
San Jose (Diridon)			0	0	0	0	18.8	0
Morgan Hill (Caltrain)			0	0	0	0	11.0	0
Gilroy (Caltrain)			0	0	0	0	40.1	0
East Bay to Central Valley: Altamont Pass	1 of 4	I-680/ 580/UPRR	3.7	2,583	0.0	62.5	105.6	3
		I-580/ UPRR	8.2	2,280	2.1	61.5	103.8	5
		Patterson Pass/UPRR	9.4	1,861	0.0	46.6	152.2	4
		UPRR	7.0	1,957	0.0	64.1	152.1	5
	1 of 4	Tracy Downtown (BNSF Connection)	41.4	6,228	2.3	15.8	329.3	2
		Tracy ACE Station (BNSF Connection)	48.9	7,390	3.0	17.2	331.9	2
		Tracy ACE Station (UPRR Connection)	29.3	5,433	2.1	17.2	205.2	1
		Tracy Downtown (UPRR Connection)	32.0	5,384	2.3	15.8	241.2	1
	2 of 2	East Bay Connections	0.6	322	0.0	30.3	18.9	

Corridor	Possible Alignments	Alignment Alternative	Floodplains (acres)	Streams (linear feet)	Lakes/ Bay (acres)	Erosion (acres)	Groundwater (acres)	Section 303d Waters Affected
Station Location Options								
Pleasanton (I-680/Bernal Rd)			0	0	0	0	10.9	0
Pleasanton (BART)			2.4	438	0	0	16.2	0
Livermore (Downtown)			0	0	0	0	13.3	0
Livermore (I-580)			1.7	174	0	8.3	15.9	0
Livermore (Greenville Road/UPRR)			0	0	0	0	12.9	0
Livermore (Greenville Road/I-580)			0	0	0	8.2	13.8	0
Tracy (Downtown)			0	0	0	0	11.8	0
Tracy (ACE)			0	0	0	0	15.0	0
San Francisco Bay Crossings	1 of 2	Trans Bay Crossing – Transbay Transit Center	0.0	0	36.5	0.0	0	2
		Trans Bay Crossing – 4th & King	0.0	0	35.4	0.0	0	2
	1 of 6	Dumbarton (High Bridge)	47.4	1,028	37.3	10.0	133.7	1
		Dumbarton (Low Bridge)	47.4	1,028	37.3	10.0	133.7	1
		Dumbarton (Tube)	47.4	1,028	37.3	10.0	133.7	1
		Fremont Central Park (High Bridge)	71.7	2,041	46.3	0.0	127.7	1
		Fremont Central Park (Low Bridge)	71.7	2,041	46.3	0.0	127.7	1
		Fremont Central Park (Tube)	71.7	2,041	46.3	0.0	127.7	1

Corridor	Possible Alignments	Alignment Alternative	Floodplains (acres)	Streams (linear feet)	Lakes/ Bay (acres)	Erosion (acres)	Groundwater (acres)	Section 303d Waters Affected
Station Location Options								
Union City (Shinn)			0	0	0	0	17.8	0
Central Valley	1 of 6	BNSF – UPRR	183.5	8,291	1.5	0	576.1	6
		BNSF	191.1	8,398	1.6	0	584.1	6
		UPRR N/S	123.4	7,547	0.0	0.0	606.5	3
		BNSF Castle	158.2	6.965	1.6	0	586.1	6
		UPRR – BNSF Castle	97.7	7,734	0.1	0.0	593.7	2
		UPRR – BNSF	123.1	9,060	0.0	0.0	582.9	3
Station Location Options								
Modesto (Downtown)			0	0	0	0	8.5	0
Briggsmore (Amtrak)			0	0	0	0	14.2	0
Merced (Downtown)			11.7	0	0	0	11.7	0
Castle AFB			0	416	0	0	18.0	0

Table 3.14-2. Summary of Indirect Water Resource Impacts for Alignment Alternatives and Station Location Option Comparisons

Corridor	Possible Alignments	Alignment Alternative	Floodplains (acres)	Streams (linear feet)	Lakes/ Bay (acres)	Erosion (acres)	Groundwater (acres)	Section 303d Waters
San Francisco to San Jose: Caltrain	1 of 1	San Francisco to Dumbarton	101.2	2,617	3.4	17.7	579.2	1
	1 of 1	Dumbarton to San Jose	74.2	2,649	0.0	0.0	517.9	6
Station Location Options								
Transbay Transit Center			0	0	0	0	12.7	0
4th and King (Caltrain)			0	0	0	0	48.8	0
Millbrae/SFO			0.1	0	0	0	15.2	0
Redwood City (Caltrain)			0	0	0	0	9.5	0
Palo Alto (Caltrain)			0	0	0	0	27.4	0
Oakland to San Jose: Niles/I-880	1 of 2	West Oakland to Niles Junction	9.5	8,828	0.0	25.4	329.8	3
		12th Street/City Center to Niles Junction	9.5	8,828	0.0	25.4	326.1	3
	1 of 2	Niles Junction to San Jose via Trimble	129.8	2,220	1.3	45.2	484.7	3
		Niles Junction to San Jose via I-880	167.0	2,707	1.3	45.2	445.9	3

Corridor	Possible Alignments	Alignment Alternative	Floodplains (acres)	Streams (linear feet)	Lakes/ Bay (acres)	Erosion (acres)	Groundwater (acres)	Section 303d Waters
Station Location Options								
West Oakland/7th Street			0	0	0	0	8.0	0
12th Street/City Center			0	0	0	0	7.9	0
Coliseum/Airport			2.8	1,734	0	0	20.1	0
Union City (BART)			1.4	831	0	0	63.8	0
Fremont (Warm Springs)			0	0	0	0	91.8	0
San Jose to Central Valley: Pacheco Pass	1 of 1	Pacheco	303.5	9,215	0.0	146.3	1,031.1	5
	1 of 3	Henry Miller (UPRR Connection)	469.5	44,458	10.0	88.9	1,412.5	3
		Henry Miller (BNSF Connection)	487.3	43,420	10.6	88.9	1,468.3	3
		GEA North	158.3	20,436	8.4	144.2	1,304.4	3
Station Location Options								
San Jose (Diridon)			0	0	0	0	24.6	0
Morgan Hill (Caltrain)			0	0	0	0	15.6	0
Gilroy (Caltrain)			0	0	0	0	46.7	0
East Bay to Central Valley: Altamont Pass	1 of 4	I-680/ 580/UPRR	18.8	13,310	0.0	210.1	424.1	3
		I-580/ UPRR	33.7	9,243	7.5	186.3	342.0	5
		Patterson Pass/UPRR	20.6	6,253	0.0	197.8	314.8	4
		UPRR	16.2	6,195	0.0	195.8	318.7	5

Corridor	Possible Alignments	Alignment Alternative	Floodplains (acres)	Streams (linear feet)	Lakes/ Bay (acres)	Erosion (acres)	Groundwater (acres)	Section 303d Waters
	1 of 4	Tracy Downtown (BNSF Connection)	136.0	19,257	7.6	63.5	1,165.4	2
		Tracy ACE Station (BNSF Connection)	154.5	24,468	13.0	70.0	1,137.0	2
		Tracy ACE Station (UPRR Connection)	76.8	13,161	9.2	70.0	629.2	1
		Tracy Downtown (UPRR Connection)	99.6	15,605	7.6	63.5	812.6	1
	2 of 2	East Bay Connections	2.3	1,805	0.0	37.4	75.8	
Station Location Options								
Pleasanton (I-680/Bernal Rd)			0	0	0	0	15.6	0
Pleasanton (BART)			3.3	538	0	0	21.1	0
Livermore (Downtown)			0	276	0	0	17.2	0
Livermore (I-580)			2.7	0	0	11.7	23.1	0
Livermore (Greenville Road/UPRR)			0	0	0	0	21.91	0
Livermore (Greenville Road/I-580)			0	0	0	11.6	19.8	0
Tracy (Downtown)			0	0	0	0	16.3	0
Tracy (ACE)			0	0	0	0	20.3	0

Corridor	Possible Alignments	Alignment Alternative	Floodplains (acres)	Streams (linear feet)	Lakes/ Bay (acres)	Erosion (acres)	Groundwater (acres)	Section 303d Waters
San Francisco Bay Crossings	1 of 2	Trans Bay Crossing – Transbay Transit Center	0.0	0	235.5	0.0	0	2
		Trans Bay Crossing – 4th & King	0.0	0	228.0	0.0	0	2
	1 of 6	Dumbarton (High Bridge)	162.1	3,627	143.9	40.1	405.9	1
		Dumbarton (Low Bridge)	162.1	3,627	143.9	40.1	405.9	1
		Dumbarton (Tube)	162.1	3,627	143.9	40.1	405.9	1
		Fremont Central Park (High Bridge)	258.7	8,301	179.2	0.0	450.6	1
		Fremont Central Park (Low Bridge)	258.7	8,301	179.2	0.0	450.6	1
		Fremont Central Park (Tube)	258.7	8,301	179.2	0.0	450.6	1

Corridor	Possible Alignments	Alignment Alternative	Floodplains (acres)	Streams (linear feet)	Lakes/ Bay (acres)	Erosion (acres)	Groundwater (acres)	Section 303d Waters
Station Location Options								
Union City (Shinn)			0	0	0	0	22.9	0
Central Valley	1 of 6	BNSF–UPRR	669.5	31,632	6.3	0	2,108.1	6
		BNSF	759.2	32,594	6.7	0	2,218.9	6
		UPRR N/S	422.7	41,122	0.0	0	2,122.8	3
		BNSF Castle	628.8	30,371	6.7	0	2,220.6	6
		UPRR–BNSF Castle	388.0	43,276	0.4	0	2,243.4	2
		UPRR–BNSF	428.7	44,538	0.0	0	2,131.0	3
Station Location Options								
Modesto (Downtown)			0	0	0	0	12.6	0
Briggsmore (Amtrak)			0	0	0	0	18.9	0
Merced (Downtown)			15.3	0	0	0	15.3	0
Castle AFB			0	516	0	0	23.5	0

San Francisco to San Jose Corridor

Alignment Alternatives

San Francisco to Dumbarton Alignment Alternative

This alignment alternative could potentially affect at least 16 named and unnamed water resources, including (i.e., not limited to) Oyster Point Channel, San Bruno Channel, San Bruno Canal, Colma Creek, Mills Creek, San Mateo Creek, and Pulgas Creek.

This alignment alternative could directly impact 49.3 ac (19.95 ha) of areas identified as 100-year floodplains. In addition, 1,178 linear ft (359.1 m) of streams, rivers, and channels could be directly impacted. Surface water bodies are not present in the area of the alignment alternative and therefore would not be affected. Finally, the San Francisco to Dumbarton alignment alternative could directly impact 268 ac (108.46 ha) of groundwater and 8.5 ac (3.44 ha) of land that has potentially erosive conditions. (See Table 3.14-1.)

This alignment alternative could indirectly impact 101.2 ac (40.96 ha) of areas identified as 100-year floodplains. In addition, 2,617 linear ft (797.7 m) of streams, rivers, and channels could be impacted. Finally, this alignment alternative could indirectly impact 579.2 ac (234.4 ha) of groundwater and 17.7 ac (7.16 ha) of land that has potentially erosive conditions (Table 3.14-2).

The San Francisco to Dumbarton alignment alternative would traverse San Mateo Creek, which is identified by the State of California as a TMDL impaired water for the following pollutants: chlordane, DDT, dieldrin, dioxin compounds (including 2,3,7,8-TCDD), exotic species, furan compounds, mercury, PCBs, PCBs (Dioxin Like), selenium, and diazinon. The construction and operation of the HST is not a likely source of any of these contaminants; therefore, this alignment alternative is not expected to increase identified contaminants of this impaired water (Table 3.14-A-5 in Appendix 3.14-A).

Dumbarton to San Jose Alignment Alternative

This alignment alternative would continue south, from Redwood City to San Jose. The alignment alternative could potentially affect at least nine named and unnamed water resources, including (i.e., not limited to) San Francisquito Creek, Matadero Creek, Barron Creek, Permenente Creek, Stevens Creek, Calabasas Creek, and Saratoga Creek.

The Dumbarton to San Jose alignment alternative could directly impact 46.5 ac (18.82 ha) of floodplains. In addition, 1,435 linear ft (437.4 m) of streams, rivers, and channels could be directly impacted. Surface water bodies are not in the study area and therefore would not be impacted by this alignment alternative. Finally, the alignment alternative could directly impact 238.8 ac (96.64 ha) of groundwater. None of the land has potentially erosive conditions; therefore, erosion impacts would not occur (Table 3.14-1).

The Dumbarton to San Jose alignment alternative could indirectly impact 74.2 ac (30.03 ha) of floodplain. In addition, 2,649 linear ft (807.4 m) of streams, rivers, and channels could be impacted. Surface water bodies are not in the study area and therefore would not be impacted. Finally, 517.91 ac (209.59 ha) of groundwater could be indirectly impacted. None of the land has potentially erosive soil conditions; therefore, erosion impacts would not occur. (See Table 3.14-2)

This alignment alternative would traverse TMDL impaired segments of the following six water resources: San Francisquito Creek, Matadero Creek, Stevens Creek, Permanente Creek, Calabasas Creek, and Saratoga Creek. Diazinon is identified as the impairment for these water resources. The construction and operation of the HST is not a likely source of these contaminants; therefore, the alignment alternative is not expected to increase the identified contaminants of waters in the study area. San Francisquito Creek is also impaired for sediment and siltation. The construction of the HST may affect sediment and siltation in San Francisquito Creek.

Station Location Options
There are no floodplains, streams, surface water bodies, or potentially erosive soils within the vicinity of the stations in this corridor. The only differences relate to groundwater. Refer to Tables 3.14-1 and 3.14-2.

Transbay Transit Center
The station location option could directly impact 9.1 ac (3.68 ha) of groundwater and indirectly impact 12.7 ac (5.14 ha).

4th and King (Caltrain) Station
The station location option could directly impact 40.6 ac (16.43 ha) of groundwater and indirectly impact 48.8 ac (19.75 ha).

Millbrae-SFO Station
The station location option could directly impact 11 ac (4.45 ha) of groundwater and indirectly impact 15.2 ac (6.15 ha).

Redwood City (Caltrain) Station
The station location option could directly impact 6.2 ac (2.51 ha) of groundwater and indirectly impact 9.5 ac (3.84 ha).

Palo Alto (Caltrain) Station
The station location option could directly impact 20.7 ac (8.38 ha) of groundwater and indirectly impact 27.4 ac (11.09 ha).

Summary of Impacts
As shown in Tables 3.14-1 and 3.14-2, the San Francisco to San Jose corridor does not include optional alignment alternatives. This corridor generally follows and is adjacent to the Caltrain corridor and minimizes impacts on water resources. At least 25 named and unnamed water resources in the area could be affected within this corridor.

Direct Impacts
The HST has the potential to directly impact 95.8 ac (38.77 ha) of 100-year floodplains, primarily along the segments south of SFO, in Palo Alto, and in Sunnyvale. Within this corridor, the 100-year floodplain is often confined by the embankments of the existing Caltrain or roadway facility. Although there are no surface water bodies in the direct path of the alignment alternatives, there is the potential to impact 2,613 linear ft (796.5 m) of streams, creeks, and channels. In addition, 506.8 ac (205.1 ha) of groundwater basins could be affected. Given the developed and urban area in which the HST is proposed within this corridor, the change in impervious surfaces would be minimal and impacts on groundwater recharge would be low. This corridor would extend through approximately 8.5 ac (3.44 ha) of potentially erosive soil conditions between San Francisco and Millbrae near the Bay. (See Table 3.14-1.)

Indirect Impacts
During site grading and construction activities, areas of bare soil would likely be exposed to erosive forces. Bare soils are much more likely to erode than vegetated areas due to the lack of dispersion, infiltration, and retention created by covering vegetation. Construction activities involving soil disturbance, excavation, cutting/filling, stockpiling, and grading activities could result in increased erosion and sedimentation to surface waters. If precautions are not taken to contain contaminants, construction could produce contaminated stormwater runoff, a major contributor to the degradation of water quality. Hazardous materials associated with construction equipment could also adversely affect water quality if spilled or stored improperly. In addition, construction in areas of high groundwater could require dewatering, with subsequent discharge to surface waters. This process could result in the release of sediment or other contaminants to surface waters.

Construction near the bay or river, stream, and canal crossings has the potential to degrade water quality due to the direct exposure of surface waters to construction-related contaminants. Water quality impacts from construction activities could violate water quality standards, exceed contaminant loadings in impaired waters, provide additional sources of polluted runoff, or otherwise degrade water quality. Construction activities such as excavation, trenching, or tunneling that occur in areas of high groundwater could impact groundwater supplies. While construction activities would also likely occur within a 100-year floodplain, the potential to expose workers to a risk of loss, injury, or death if flooding were to occur during construction would be minimal.

The San Francisco to San Jose corridor has the potential to indirectly impact 175.77 ac (71.13 ha) of floodplains. Although there are no surface water bodies immediately adjacent to the alignment alternatives, there is the potential to impact 5,266 linear ft (1,605.1 m) of streams, creeks, and channels. Finally, 1,097.1 ac (444 ha) of groundwater and 17.7 ac (7.18 ha) of land with potentially erosive soil conditions could be indirectly impacted. (See Table 3.14-2.)

TMDL

The corridor traverses seven TMDL-impaired segments of water resources in the area. The construction and operation of the HST is an unlikely source of most of the contaminants that impair the water resources. The contaminants are generally chlorinated hydrocarbons, heavy metals, and organophosphate pesticides. However, San Francisquito Creek is impaired for sediment and siltation, and the construction of the Dumbarton to San Jose alignment alternative may affect the sediment/silt load in this drainage.

Oakland to San Jose Corridor

Alignment Alternatives

West Oakland to Niles Junction Alignment Alternative

This alignment alternative could potentially affect at least 13 named and unnamed water resources, including (i.e., not limited to) Arroyo Viejo, Lion Creek, San Leandro Creek, San Lorenzo Creek, and Alameda Creek.

The West Oakland to Niles Junction alignment alternative could directly impact 4.3 ac (1.74 ha) of floodplains. In addition, it could directly impact 1,035 linear ft (315.5 m) of streams, rivers, and channels. Surface water bodies are not in the study area and therefore would not be directly affected. Finally, the alignment alternative could directly impact 133.2 ac (53.91 ha) of groundwater and 12.6 ac (5.1 ha) of land that has potentially erosive soil conditions. (See Table 3.14-1)

This alignment alternative could indirectly impact 9.5 ac (3.84 ha) of floodplains. In addition, 8,828 linear ft (2,690.8 m) of streams, rivers, and channels could be indirectly impacted. There are no surface water bodies in the study area, and therefore no impact would occur. Finally, the West Oakland to Niles Junction alignment alternative could indirectly impact 329.8 ac (133.47 ha) of groundwater and 25.4 ac (10.28 ha) of land that has potentially erosive conditions. (See Table 3.14-2.)

The alignment alternative would traverse TMDL impaired segments of the following three water resources: San Leandro Creek, San Lorenzo Creek, and Alameda Creek. These waters are impaired with diazinon. The construction and operation of the HST is not a likely source of these pollutants; therefore, the HST is not expected to increase the identified contaminants of these waters.

12th Street/City Center to Niles Junction Alignment Alternative

This alignment alternative could potentially affect the same 13 named and unnamed water resources as the West Oakland to Niles Junction alignment alternative. This alignment alternative would also have the same direct impacts on floodplains, streams and waters, and land with potentially erosive soil conditions. The direct impact of this alignment alternative on groundwater would be 132.1 ac (53.46 ha). (See Table 3.14-1.)

This alignment alternative would also have the same indirect impacts on floodplains, streams and waters, and land with potentially erosive soil conditions as the West Oakland to Niles Junction alignment alternative. The indirect impact of this alignment alternative on groundwater would be 326.1 ac (131.97 ha) of groundwater. (See Table 3.14-2.)

The alignment alternative would traverse the same TMDL impaired segments of surface waters as the West Oakland to Niles Junction alignment alternative (San Leandro Creek, San Lorenzo Creek, and Alameda Creek). The construction and operation of the HST is not a likely source of diazinon; therefore, the HST is not expected to increase the identified contaminants of these waters.

Niles Junction to San Jose via Trimble Alignment Alternative
This alignment alternative could potentially affect eight named and unnamed water resources, including (i.e., not limited to) Mission Creek, Alameda Creek, the Lagoon/Elizabeth Lake, Penitencia Creek, and Mud Slough/Coyote Creek.

This alignment alternative could directly impact 36.4 ac (14.73 ha) of floodplains. In addition, 1,013 linear ft (308.8 m) of streams, rivers, and channels and 0.7 ac (0.28 ha) of surface water bodies could be impacted. The Niles Junction to San Jose via Trimble alignment alternative could also directly impact 143.2 ac (57.95 ha) of groundwater and 22.5 ac (9.11 ha) of land with potentially erosive soil conditions. (See Table 3.14-1.)

The Niles Junction to San Jose via Trimble alignment alternative could indirectly impact 129.8 ac (52.53 ha) of floodplains. In addition, 2,220 linear ft (676.7 m) of streams, rivers, and channels and 1.3 ac (0.53 ha) of surface water bodies could be impacted. This alignment alternative could also indirectly impact 484.7 ac (196.16 ha) of groundwater and 45.20 ac (18.29 ha) of land with potentially erosive soil conditions. (See Table 3.14-2.)

The Niles Junction to San Jose via Trimble alignment alternative would traverse TMDL-impaired segments of three of the following surface water resources: Mission Creek, Mud Slough/Coyote Creek, and Guadalupe River/Creek. These waters are impaired for the following pollutants: diazinon and mercury. The construction and operation of the HST is not a likely source of these contaminants; therefore, the HST is not expected to increase the identified contaminants of these waters. Mission Creek is also impaired for ammonia, chlordane (sediment), dieldrin (sediment), hydrogen sulfide, lead (sediment), mercury (sediment), PAHs, PCBs, silver (sediment), and zinc (sediment). Construction and operation of the HST along this alignment alternative is not a likely source of these contaminants; however, sediment transport from construction may affect lead, mercury, silver, and zinc concentrations in Mission Creek.

Niles Junction to San Jose via I-880 Alignment Alternative
This alignment alternative could potentially affect the same eight named and unnamed water resources as the Niles Junction to San Jose via Trimble alignment alternative; however, this alignment alternative would also cross independent segments of Coyote Creek and Guadalupe River for a total of at least 10 water resources potentially affected.

This alignment alternative could directly impact 45.5 ac (18.41 ha) of floodplains. In addition, 1,135 linear ft (345.9 m) of streams, rivers, and channels and 0.7 ac (0.28 ha) of surface water bodies could be impacted. Finally, the Niles Junction to San Jose via I-880 alignment alternative could directly impact 134.5 ac (54.43 ha) of groundwater and 22.5 ac (9.11 ha) of land with potentially erosive soil conditions. (See Table 3.14-1.)

This alignment alternative could indirectly impact 167 ac (67.58 ha) of floodplains. In addition, 2,707 linear ft (825.1 m) of streams, rivers, and channels and 1.3 ac (0.53 ha) of surface waters bodies could be affected. The Niles Junction to San Jose via I-880 alignment alternative could also indirectly impact 445.9 ac (180.46 ha) of groundwater and 45.20 ac (18.29 ha) of land with potentially erosive soil conditions. (See Table 3.14-2.)

The alignment alternative would traverse TMDL-impaired segments of the same three water resources as the Trimble alignment alternative (Mission Creek, Coyote Creek, and Guadalupe Creek/River). Construction and operation of the HST is not a likely source of the impaired contaminants for these waters; however, sediment transport from construction along this alignment alternative may affect lead, mercury, silver, and zinc concentrations in Mission Creek.

Station Location Options

There are no floodplains, streams, surface water bodies, or potentially erosive soils within the vicinity of the West Oakland/7th Street, 12th Street/City Center, and Freemont (Warm Springs) station location options.

West Oakland/7th Street Station

The station location option could directly impact 5.1 ac (2.06 ha) of groundwater and indirectly impact 8 ac (3.24 ha).

12th Street/City Center Station

The station location option could directly impact 4.8 ac (1.94 ha) of groundwater and indirectly impact 7.9 ac (3.2 ha).

Coliseum/Airport Station

There are 1.6 ac (0.65 ha) of floodplains and 1,683 linear ft (513 m) of streams, rivers, and channels that could be directly impacted by this station location option. Also, 15.1 ac (6.11 ha) of groundwater could be directly impacted. Indirect impacts could occur to 2.8 ac (1.13 ha) of floodplains and 1,734 linear ft (528.5 m) of streams, rivers, and channels. In addition, 20.1 ac (8.13 ha) of groundwater could also be indirectly impacted. There are no surface water bodies or land with potentially erosive soil conditions near this station location option.

Union City (BART) Station

There are 1.1 ac (0.45 ha) of floodplains and 273 linear ft (83.2 m) of streams, rivers, and channels that could be directly impacted by this station. Also, 56 ac (22.66 ha) of groundwater could be directly impacted. Indirect impacts could occur to 1.4 ac (0.57 ha) of floodplains and 831 linear ft (253.3 m) of streams, rivers, and channels. In addition, 63.8 ac (25.82 ha) of groundwater could also be indirectly impacted. There are no surface water bodies or land with potentially erosive soil conditions near this station location option.

Freemont (Warm Springs) Station

The station could directly impact 81.3 ac (32.90 ha) of groundwater and indirectly impact 91.8 ac (37.15 ha).

Summary of Impacts

As shown in Tables 3.14-1 and 3.14-2, a combination of alignment alternatives would be required within this corridor to complete the connection from Oakland to San Jose. The discussion below compares the potential direct and indirect impacts of the West Oakland to Niles Junction alignment alternative to the 12th Street/City Center to Niles Junction alignment alternative and the Niles Junction to San Jose via Trimble alignment alternative to the Niles Junction to San Jose via I-880 alignment alternative.

The West Oakland to Niles Junction and or Niles Junction to San Jose via I-880 alignment alternatives could potentially affect 21 and 23 named and unnamed water resources, respectively. The 12th Street/City Center to Niles Junction and the Niles Junction to San Jose via Trimble alignment alternatives could affect the same water resources, respectively. The Niles Junction to San Jose via I-880 alignment alternative could also affect different segments of Coyote Creek and Guadalupe River not affected by the Niles Junction to San Jose via Trimble alignment alternative.

Direct Impacts
As shown in Table 3.14-1, the West Oakland to Niles Junction alignment alternative would have slightly more impact on groundwater as compared to the 12th Street/City Center to Niles Junction alignment alternative. Both of these alignment alternatives include tunnels that would avoid impacts on the floodplain, and aerial structures that would minimize impact on the floodplain and streams, creeks, and channels. The tunnels in downtown Oakland, either on the West Oakland or 12th Street/City Center to Niles Junction alignment alternatives, would have the potential to encounter groundwater and would require dewatering as part of construction and possibly during operation. The West Oakland to Niles Junction alignment alternative extends under the tributary that extends from Lake Merritt to the Bay. Other areas along these alignment alternatives are highly developed and the change in impervious surfaces would be minimal, and the impacts on groundwater recharge would be low. Both of these alignment alternatives would extend through approximately 12.6 ac (5.1 ha) of potentially erosive soil conditions near Niles Boulevard. Overall, the direct impacts of these two alignment alternatives on water resources are essentially the same.

The Niles Junction to San Jose via Trimble alignment alternative would have the potential to affect approximately 9 ac (3.64 ha) more groundwater than the Niles Junction to San Jose via I-880 alignment alternative, primarily due to the longer length of the Trimble Road option to San Jose. The Niles Junction to San Jose via Trimble alignment alternative would likely encounter groundwater in the South Bay area even though almost 3 miles (4.8 km) of this alignment alternative would be in tunnel along Trimble Road. Dewatering would likely be required during construction and potentially during operation of the HST where the tunnel would encounter groundwater. The tunnel for this alignment alternative would also extend under the Guadalupe River and Coyote Creek, whereas the Niles Junction to San Jose via I-880 alignment alternative would extend over these on aerial structure. Both alignment alternatives may also encounter groundwater where column support footings would be required for aerial structures. Because most of the Niles Junction to San Jose via Trimble alignment alternative would be on aerial structure or in tunnel (along Trimble Road), impacts on 100-year floodplains and streams in the South Bay area would be minimized. Impacts on the floodplain from aerial structures would be limited to column footings. The Niles Junction to San Jose via I-880 alignment alternative extends through additional floodplain areas near the San Jose International Airport, but the potential for impacts would be minimized by using aerial structures for the HST. The amount of erosive soil effects would also be the same for these two alignment alternatives. Overall, the Niles Junction to San Jose via Trimble alignment alternative would have the least potential for direct impacts to floodplains and streams, but it has a higher potential to encounter groundwater due to tunneling along Trimble Road.

Indirect Impacts
Potential indirect impacts from construction within this corridor would be similar to those discussed for the San Francisco to San Jose corridor.

Comparison of the indirect impacts for the West Oakland to Niles Junction and 12th Street/City Center to Niles Junction alignment alternatives is also consistent with what was described above for the direct impacts except for the potential amount of impact that could occur. Overall, the indirect impacts of these two alignment alternatives on water resources are essentially the same (see Table 3.14-2).

Comparison of the indirect impacts for the Niles Junction to San Jose via Trimble and Niles Junction to San Jose via I-880 alignment alternatives is also consistent with what was described above for the direct impacts except for the potential amount of impact that could occur. Overall, the Niles Junction to San Jose via Trimble alignment alternative would have the least potential for indirect impacts to floodplains and streams, but it has a higher potential to encounter groundwater due to tunneling along Trimble Road. (Table 3.14-2)

TMDL

All the alignment alternatives would traverse the same TMDL-impaired sections of water resources. The impaired sections are impaired for the organophosphate pesticide, diazinon. The construction and operation of the HST is not expected to be a likely source of diazinon; therefore, impacts would not occur to the impaired sections. However, the Niles Junction to San Jose via Trimble and Niles Junction to San Jose via I-880 alignment alternatives would both traverse one impaired section of Mission Creek with sediment contamination. Construction of either of these two alignment alternatives could cause sediment transport that could affect the concentrations of sediment contamination.

<u>San Jose to Central Valley Corridor</u>

Alignment Alternatives

Pacheco Alignment Alternative

This alignment alternative could potentially affect at least 13 unnamed and named water resources, including (i.e., not limited to) Los Gatos Creek, Guadalupe River, Little Llagas Creek, Llagas Creek, Miller Slough, Pajaro River, Pacheco Creek, and Tequisquita Slough.

The Pacheco alignment alternative could directly impact 103.4 ac (41.84 ha) of floodplains. In addition, 2,674 linear ft (815 m) of streams, rivers, and channels could be affected. There are no surface water bodies that would be affected. Finally, this alignment alternative could impact 451 ac (182.52 ha) of groundwater and 41.8 ac (16.92 ha) of land with potentially erosive soil conditions. (See Table 3.14-1.)

This alignment alternative could indirectly impact 303.5 ac (122.83 ha) of floodplains. In addition, 9,215 linear ft of (2,808.7 m) streams, rivers, and channels could be affected. There are no surface water bodies that would be affected. The Pacheco alignment alternative could indirectly impact 1,031.1 ac (417.29 ha) of groundwater and 146.3 ac (59.21 ha) of land that may have erosive soil conditions. (See Table 3.14-2.)

The alignment alternative would traverse TMDL-impaired segments of four surface water resources: Los Gatos Creek, Guadalupe Creek/River, Llagas Creek, and Pajaro River. These waters are impaired with the following pollutants: diazinon, mercury, boron, fecal coliform, chloride, low dissolved oxygen, nitrate, and pH. The construction and operation of the HST is not a likely source of these contaminants; therefore, the alignment alternative is not expected to increase the identified contaminants of these waters. Llagas Creek is also impaired for total dissolved solids (TDS), and any sediment increase associated with construction and operation of the alignment alternative could increase the levels of TDS in the creek. The alignment alternative would be downstream of Tequisquita Slough, a tributary to Pajaro River, which is impaired for fecal coliform. The construction and operation of the HST along this alignment alternative is not a likely source of this contaminant; therefore, the HST is not expected to affect fecal coliform levels in the Pajaro River.

Henry Miller (UPRR Connection) Alignment Alternative

This alignment alternative could potentially affect at least 44 unnamed and named water resources, including (i.e., not limited to) Tule Lake, California Aqueduct, San Luis Creek, Mendota Canal, Main Canal, Los Banos Creek, Los Banos Wildlife Area, San Luis Wasteway, Mud Slough, Delta Canal, Santa

Rita Slough/Salt Slough, San Joaquin River, Mariposa Slough, Chowchilla River, Ash Slough, and Berenda Slough.

This alignment alternative could directly impact 126.4 ac (51.15 ha) of floodplains. In addition, 6,697 linear ft (2,041.2 m) of streams, rivers, and channels and 2.3 ac (0.93 ha) of surface water bodies could be affected. The Henry Miller (UPRR Connection) alignment alternative could also directly impact 355.4 ac (143.83 ha) of groundwater and 22.2 ac (8.98 ha) of land with potentially erosive soil conditions. (See Table 3.14-1.)

This alignment alternative could indirectly impact 469.5 ac (190.01 ha) of floodplains. In addition, 44,458 linear ft (13,550.8 m) of streams, rivers, and channels and 10.0 ac (4.05 ha) of surface water bodies could be indirectly impacted. Finally, this alignment alternative could indirectly impact 1,412.5 ac (571.64 ha) of groundwater and 88.9 ac (35.98 ha) of land with potentially erosive soil conditions. (See Table 3.14-2.)

The alignment alternative would traverse TMDL-impaired segments of three surface water resources: Mud Slough, San Joaquin River (portion from the Mendota Pool to Bear Creek), and Santa Rita Slough/Salt Slough (portion upstream from the confluence with the San Joaquin River). These waters are impaired with the following pollutants: boron, electrical conductivity, DDT, unknown toxicity, Group A pesticides (aldrin, dieldrin, chlordane, endrin, heptachlor, heptachlor expoxide, hexachlorocyclohexane—including lindane—endosulfan, and toxaphene), diazinon, and chlorpyrifos. Construction and operation of the HST is not a likely source of these contaminants; however, the Central Valley has a long history of heavy pesticide use and depending on the binding properties of the pesticides to soil and water, sediment runoff from the construction could potentially mobilize and release additional pesticides into these water resources.

Henry Miller (BNSF Connection) Alignment Alternative
This alignment alternative could potentially affect the same 44 named and unnamed streams listed above in the Henry Miller (UPRR Connection) alignment alternative.

This alignment alternative could directly impact 130.4 ac (52.77 ha) of floodplains. In addition, 6,266 linear ft (1,909.9 m) of streams, rivers, and channels and 2.5 ac (1.01 ha) of surface water bodies could be affected. The Henry Miller (BNSF Connection) alignment alternative could also directly impact 366.9 ac (148.48 ha) of groundwater and 22.2 ac (8.96 ha) of land with potentially erosive soil conditions. (See Table 3.14-1.)

This alignment alternative could indirectly impact 487.3 ac (197.21 ha) of floodplains. In addition, 43,420 linear ft (13,234.4 m) of streams, rivers, and channels and 10.6 ac (4.29 ha) of surface water bodies could be indirectly affected. This alignment alternative could also indirectly impact 1,468.3 ac (594.22 ha) of groundwater and 88.9 ac (35.98 ha) of land with potentially erosive soil conditions. (See Table 3.14-2.)

The Henry Miller (BNSF Connection) alignment alternative would traverse the same TMDL-impaired segments of the three surface water resources identified by the Henry Miller (UPRR Connection) alignment alternative (Mud Slough, San Joaquin River, and Santa Rita Slough/Salt Slough). Construction and operation of the HST is not a likely source of the contaminants affecting these waters; however, the Central Valley has a long history of heavy pesticide us and depending on the binding properties of the pesticides to soil and water, sediment runoff from the construction could potentially mobilize and release additional pesticides into these water resources.

GEA North Alignment Alternative
The GEA North alignment alternative could potentially affect at least 44 unnamed and named water resources, including (i.e., not limited to) California Aqueduct, Mendota Canal, Garzas Creek, Sullivan

Extension, Duck Ponds, Mud Slough, San Joaquin River, Cottonwood Creek, Los Banos Creek, Livingston Canal, and the Merced River.

This alignment alternative could directly impact 53.1 ac (21.48 ha) of floodplains. In addition, 6,771 linear ft (2,063.8 m) of streams, rivers, and channels and 2.3 ac (0.93 ha) of surface water bodies could be affected. Finally, the GEA North alignment alternative could directly impact 340.3 ac (137.72 ha) of groundwater and 36 ac (14.57 ha) of land with potentially erosive soil conditions. (See Table 3.14-1.)

This alignment alternative could indirectly impact 158.3 ac (64.04 ha) of floodplains. In addition, 20,436 linear ft (6,228.9 m) of streams, rivers, and channels and 8.4 ac (3.4 ha) of surface water bodies could be indirectly affected. This alignment alternative could also indirectly impact 1,304.4 ac (527.89 ha) of groundwater and 144.2 ac (58.36 ha) of land with potentially erosive soil conditions. (See Table 3.14-2.)

The GEA North alignment alternative would cross the San Joaquin River (portion from Bear Creek to Mud Slough), which is impaired for the following pollutants: boron, electrical conductivity, DDT, unknown toxicity, Group A pesticides (aldrin, dieldrin, chlordane, endrin, heptachlor, heptachlor expoxide, hexachlorocyclohexane—including lindane—endosulfan, and toxaphene), diazinon, and chlorpyrifos. This alignment alternative would also cross the Merced River (portion from McSwain Reservoir to San Joaquin River), which is impaired for the following pollutants: chlorphrifos, diazinon, Group A pesticides (including: aldrin, dieldrin, chlordane, endrin, heptachlor, heptachlor expoxide, hexachlorocyclohexane—including lindane—endosulfan, and toxaphene), and mercury. Construction and operation of the HST is not a likely source of these contaminants; however, the Central Valley has a long history of heavy pesticide use and depending on the binding properties of the pesticides to soil and water, sediment runoff from the construction could potentially mobilize and release additional pesticides into these water resources.

<u>Station Location Options</u>

There are no floodplains, streams, surface water bodies, or potentially erosive soils within the vicinity of the station location options within this corridor.

San Jose (Diridon) Station
The station location option could directly impact 18.8 ac (7.61 ha) of groundwater and indirectly impact 24.6 ac (9.96 ha).

Morgan Hill (Caltrain) Station
The station location option could directly impact 11 ac (4.45 ha) of groundwater and indirectly impact 15.6 ac (6.31 ha).

Gilroy (Caltrain) Station
The station location option could directly impact 40.1 ac (16.23 ha) of groundwater and indirectly impact 46.7 ac (18.9 ha).

Summary of Impacts
As shown in Tables 3.14-1 and 3.14-2, any combination of alignment alternatives within this corridor would have to include the Pacheco alignment alternative to complete the connection from San Jose to the Central Valley.

The Pacheco alignment alternative could affect approximately 13 water resources. The Henry Miller alignment alternatives could affect 44 named and unnamed water resources, and the GEA North alignment alternative could also affect approximately 44 water resources. Many of the water resources identified along both of the Henry Miller alignment alternatives and GEA North alignment alternative are manmade canals and ditches used to transport agricultural waters. It should be noted that the USACE or the CDFG do not consider all canals in the Central Valley to be jurisdictional waters. Certain canals that intercept natural drainages/streams and divert the water to another water body such as a reservoir or river can be considered jurisdictional. The USACE makes those determinations on a case-by-case basis. This would occur as part of subsequent project level analysis and in close coordination with the USACE and CDFG.

Direct Impacts

The Pacheco alignment alternative generally follows and is adjacent to the Caltrain corridor from San Jose to Gilroy. From San Jose to Gilroy, this alignment alternative would be constructed at-grade and on aerial structures. From Gilroy across the Diablo Range, the alignment alternative would include a combination of at-grade, aerial structure, and tunnel. The alignment alternative crosses several major watercourses for a total of approximately 2,674 linear ft (815 m) including the Guadalupe River, Pajaro River, and several branches of Pacheco Creek. The alignment alternative extends at-grade or on aerial structure through approximately 103.4 ac (41.85 ha) of 100-year floodplains, with the largest area of floodplain being crossed at-grade between Gilroy and the Diablo Range. The HST would be constructed with culverts under the tracks to convey anticipated storm flows and to minimize ponding. Across the Diablo Range, the amount of 100-year floodplain is minimal and confined to canyons. Impacts on the floodplain from aerial structures would be limited to column footings. The potential to encounter groundwater from San Jose to Gilroy would be limited to where column support footings would be required for aerial structures. The change in impervious surfaces within this same portion would be minimal because the alignment alternative would be adjacent to the existing Caltrain and roadway corridors, which are already developed. South of Gilroy, the alignment alternative extends through agricultural areas before crossing the Diablo Range on a new track and result in a slight increase in impervious surfaces; however, the HST would consist of permeable track-fill rather than impervious pavement resulting in a low runoff potential. The potential to encounter groundwater along this portion would be limited to the area between Gilroy and the Diablo Range and the impacts on groundwater recharge would be low. The potential for erosion due to runoff would primarily be limited to locations of erosive soil conditions within the Diablo Range to the San Luis Reservoir where tunnels and earthwork would be required.

The Henry Miller and GEA North alignment alternatives would connect to the Pacheco alignment alternative north of the San Luis Reservoir. The two Henry Miller alignment alternatives would share most of the same alignment with the exception of the connections to the UPRR and BNSF. The Henry Miller (BNSF Connection) alignment alternative would have slightly more impact on the 100-year floodplain, water bodies, and groundwater as compared to the Henry Miller (UPRR Connection) alignment alternative. The alignment alternative is primarily at-grade and adjacent to Henry Miller Road, which also extends across the floodplain. The HST would be constructed to minimize additional impacts on the floodplain by constructing culverts under the track to convey anticipated storm flows and to minimize ponding. The GEA North alignment alternative would affect up to 77 ac (31.16 ha) less floodplain than either of the Henry Miller alignment alternatives. The GEA North alignment alternative would cross the 100-year floodplain in the area of Mud Slough and the San Joaquin River as well as at the two Merced River crossings where the alignment alternative connects with the BNSF and UPRR. Most of the track for the GEA North would be constructed on embankment and would be designed to convey anticipated storm flows and to minimize ponding. Overall, the GEA North alignment alternative would have the least impact on the 100-year floodplain.

While the Henry Miller and GEA North alignment alternatives would each have similar impacts on streams and canals, the Henry Miller (BNSF Connection) alternative alignment would impact between 24 and 500 linear ft less than the other two alignment alternatives. Because the Henry Miller (UPRR Connection) alignment alternative would re-cross the Chowchilla River and Ash Slough with the north connection to UPRR, the overall amount of impact on streams would be 430 linear ft (131.1 m) more than the Henry Miller (BNSF Connection). Subsequent project level analysis and coordination with the USACE and CDFG would be required to determine which canals would be considered jurisdictional. At this program level of analysis, the Henry Miller (BNSF Connection) alignment alternative would have the least impact on streams and canals.

Both of the Henry Miller alignment alternatives would have 13 ac (5.26 ha) less erosive soil effects than the GEA North alignment alternative, where additional erosive soils exist in the area between I-5 and San Luis Reservoir. The potential to encounter groundwater along each of these three options would be limited to the area east of I-5 and the impacts on groundwater recharge would be low because of the overall footprint of the HST. The potential for erosion due to runoff would primarily be limited to locations of erosive soil conditions at the edge of the Diablo Range where tunnels and earthwork would be required.

Indirect Impacts
Potential indirect impacts from construction would be similar to those discussed for the San Francisco to San Jose corridor. As shown in Table 3.14-2, the indirect impacts associated with the Pacheco alignment alternative generally follow what was described above for the direct impacts except for the potential amount of impacts that could occur.

Comparison of the indirect impacts for the Henry Miller and GEA North alignment alternatives is also consistent with what was described above except for the potential amount of impact. One exception is that the GEA North alignment alternative would indirectly impact substantially fewer streams or canals than either of the Henry Miller alignment alternatives. The GEA North alignment alternative would indirectly impact up to 24,000 less linear ft (7,315.2 m) of streams, rivers, and canals. As shown on Figure 3.14-3, there are fewer streams and canals north and south of the GEA North alignment alternative compared to the Henry Miller alignment alternatives.

TMDL
While the Pacheco alignment alternative would traverse a number of TMDL impaired water resources, the construction and operation of the HST may only impact one of these impaired resources, Llagas Creek, for TDS. Both Henry Miller alignment alternatives would traverse the same three impaired water resources: Mud Slough, San Joaquin River (portion from the Mendota Pool to Bear Creek) and Santa Rita Slough/Salt Slough (portion upstream from the confluence with the San Joaquin River). Although the construction and operation of the HST along these two alignment alternatives is not a likely source of the many contaminants identified as impairing the water resources, depending on the binding properties of the pesticides to soil and water, sediment runoff from construction could potentially mobilize and release additional pesticides into these water resources. Finally, the GEA North alignment alternative would be likely to impact the fewest impaired water resources: the San Joaquin River (segment from Bear Creek to Mud Slough) and Merced River, Lower (segment from McSwain Reservoir to San Joaquin River). However, as with the Henry Miller alignment alternatives, the sediment runoff from the construction of the HST along the GEA North alignment alternative could potentially mobilize and release additional pesticides into the San Joaquin and Merced Rivers.

<u>East Bay to Central Valley Corridor</u>

Alignment Alternatives
Altamont Pass Options (Niles Junction to Altamont)
I-680/580/UPRR Alignment Alternative
This alignment alternative could potentially affect at least 17 unnamed and named water resources, including (i.e., not limited to) Alameda Creek, Laurel Creek, Gold Creek, Arroyo Valle, Arroyo De La Laguna, Tassajara Creek, Cottonwood Creek, Arroyo Las Positas, Arroyo Seco, and South Bay Aqueduct.

This alignment alternative could directly impact 3.7 ac (1.5 ha) of floodplains. In addition, 2,583 linear ft (787.3 m) of streams, rivers, and channels could be impacted. Surface water bodies are not in the study area, and therefore impacts would not occur. Finally, this alignment alternative could directly impact 105.6 ac (42.74 ha) of groundwater and 62.5 ac (25.29 ha) of land with potentially erosive soil conditions. (See Table 3.14-1.)

The I-680/580/UPRR alignment alternative could indirectly impact 18.8 ac (7.61 ha) of floodplains. In addition, 13,310 linear ft (4,056.9 m) of streams, rivers, and channels could be indirectly affected. Surface water bodies are not in the study area of the alignment alternative, and therefore impacts would not occur. Finally, it could indirectly impact 424.1 ac (171.63 ha) of groundwater and 210.1 ac (85.03 ha) of land with potentially erosive soil conditions. (See Table 3.14-2.)

The I-680/580/UPRR alignment alternative would traverse TMDL-impaired segments of three surface water resources: Alameda Creek, Arroyo De La Laguna, and Arroyo Las Positas. These waters are impaired with diazinon. The construction and operation of the HST is not a likely source of this contaminant; therefore, this alignment alternative is not expected to increase the diazinon levels in these waters.

I-580/UPRR Alignment Alternative

This alignment alternative could potentially affect 15 unnamed and named water resources, including (i.e., not limited to) Arroyo Valle, Arroyo De La Laguna, Cottonwood Creek, Arroyo Las Positas, Arroyo Seco, Arroyo Gravel Pits/Arroyo Mocho, South Bay Aqueduct, and Patterson Run (canal).

This alignment alternative could directly impact 8.2 ac (3.32 ha) of floodplains. In addition, 2,280 linear ft (694.9 m) of streams, rivers, and channels and 2.1 ac (0.85 ha) of surface water bodies could be affected. The I-580/UPRR alignment alternative could also directly impact 103.8 ac (42.01 ha) of groundwater and 61.5 ac (24.89 ha) of land with potentially erosive soil conditions. (See Table 3.14-1.)

The I-580/UPRR alignment alternative could indirectly impact 33.7 ac (13.64 ha) of floodplains. In addition, 9,243 linear ft (2,817.3 m) of streams, rivers, and channels and 7.5 ac (3.04 ha) of surface water bodies could be indirectly impacted. Finally, this alignment alternative could indirectly impact 342 ac (138.41 ha) of groundwater and 186.3 ac (75.4 ha) of land with potentially erosive soil conditions. (See Table 3.14-2.)

The I-580/UPRR alignment alternative would traverse TMDL-impaired segments of five surface water resources including Alameda Creek, Arroyo De La Laguna, Arroyo Del Valle, Arroyo Positas, and Arroyo Mocho. These waters are impaired with diazinon. The construction and operation of the HST is not a likely source of this contaminant; therefore, the HST along this alignment alternative is not expected to increase diazinon levels in these waters.

Patterson Pass/UPRR Alignment Alternative

This alignment alternative could potentially affect nine unnamed and named water resources, including (i.e., not limited to) Arroyo Valle, Arroyo De La Laguna, Arroyo Las Positas, Arroyo Seco, Arroyo Gravel Pits/Arroyo Mocho, and South Bay Aqueduct and Patterson Run (canal).

This alignment alternative could directly impact 9.4 ac (3.8 ha) of floodplains. In addition, 1,861 linear ft (567.2 m) of streams, rivers, and channels could be impacted. Surface water bodies would not be affected. The Patterson Pass/UPRR alignment alternative could directly impact 152.2 ac (61.6 ha) of groundwater and 46.6 ac (18.86 ha) of land with potentially erosive soil conditions. (See Table 3.14-1.)

This alignment alternative could indirectly impact 20.6 ac (8.34 ha) of floodplain. In addition, 6,253 linear ft (1,905.9 m) of streams, rivers, and channels and 0.03 ac (0.01 ha) of surface water bodies could be indirectly affected. The Patterson Pass/UPRR alignment alternative could indirectly impact

314.8 ac (127.4 ha) of groundwater and 197.8 ac (80.05 ha) of land with potentially erosive soil conditions. (See Table 3.14-2.)

The Patterson Pass/UPRR alignment alternative would traverse TMDL-impaired segments of four of the five surface water resources that the I-580/UPRR alignment alternative may traverse, with the exception of Arroyo Positas. These waters are impaired with diazinon. The construction and operation of the HST is not a likely source of this contaminant; therefore, the HST along this alignment is not expected to increase diazinon levels in these waters.

UPRR Alignment Alternative
This alignment alternative could potentially affect 12 unnamed and named water resources, including (i.e., not limited to) Alameda Creek, Arroyo Valle, Arroyo De La Laguna, Arroyo Las Positas, Arroyo Seco, Arroyo Gravel Pits/Arroyo Mocho, South Bay Aqueduct, and Patterson Run (canal).

The UPRR alignment alternative could directly impact 7 ac (2.83 ha) of floodplains. In addition, 1,957 linear ft (596.5 m) of streams, rivers, and channels could be affected. Surface water bodies are not in the area; therefore, impacts would not occur. This alignment alternative could also directly impact 152.1 ac (61.55 ha) of groundwater and 64.1 ac (25.94 ha) of land with potentially erosive soil conditions. (See Table 3.14-1.)

This alignment alternative could indirectly impact 16.2 ac (6.56 ha) of floodplain. In addition, 6,195 linear ft (1,888.2 m) of streams, rivers, and channels and 0.03 ac (0.01 ha) of surface water bodies could be indirectly affected. The UPRR alignment alternative could indirectly impact 318.7 ac (128.98 ha) of groundwater and 195.8 ac (79.24 ha) of land with potentially erosive soil conditions. (See Table 3.14-2.)

The UPRR alignment alternative would traverse TMDL-impaired segments of five surface water resources: Alameda Creek, Arroyo De La Laguna, Arroyo Del Valle, Arroyo Positas, and Arroyo Mocho. These waters are impaired with diazinon. The construction and operation of the HST is not a likely source of this contaminant; therefore, the HST along this alignment is not expected to increase diazinon levels in these waters.

Altamont Pass Options
Tracy Downtown (BNSF Connection) Alignment Alternative
The Tracy Downtown (BNSF Connection) alignment alternative could potentially affect at least 14 unnamed and named water resources, including (i.e., not limited to) California Aqueduct, Delta Mendota Canal, Upper Main Canal, San Joaquin River, Paradise Cut, Tom Paine Slough, Lone Tree Creek, and Avena Drain.

This alignment alternative could directly impact 41.4 ac (16.75 ha) of floodplains. In addition, 6,228 linear ft (1,898.3 m) of streams, rivers, and channels and 2.3 ac (0.93 ha) of surface water bodies could be impacted. Finally, it could directly impact 329.3 ac (133.27 ha) of groundwater and 15.8 ac (6.39 ha) of land with potentially erosive soil conditions. (See Table 3.14-1.)

The Tracy Downtown (BNSF Connection) alignment alternative could indirectly impact 136.00 ac (55.04 ha) of floodplains. In addition, 19,257 linear ft (5,869.5 m) of streams, rivers, and channels and 7.6 ac (3.08 ha) of surface water bodies could be indirectly affected. This alignment alternative could indirectly impact 1,165.4 ac (471.64 ha) of groundwater and 63.5 ac (25.7 ha) of land with potentially erosive soil conditions. (See Table 3.14-2.)

The Tracy Downtown (BNSF Connection) alignment alternative would be downstream of the San Joaquin River (segment from Stanislaus River to Delta Boundary), identified as TMDL impaired for the following pollutants: boron, electrical conductivity, DDT, unknown toxicity, and Group A pesticides (aldrin, dieldrin, chlordane, endrin, heptachlor, heptachlor expoxide, hexachlorocyclohexane—

including lindane—endosulfan, and toxaphene), diazinon, and chlorpyrifos. Construction and operation of the HST is not a likely source of these contaminants and would not impact this impaired portion of the San Joaquin River, which is upstream of the alignment alternative and any potential contaminants from the construction or operation of the HST would travel downstream and not affect the impaired river segment. The alignment alternative would also traverse Lone Tree Creek, identified as TMDL-impaired for the following pollutants: ammonia, BOD, and electrical conductivity. Construction and operation of the HST is not a likely source of these contaminants; therefore, the alignment alternative is not expected to increase the identified contaminants in Lone Tree Creek.

Tracy ACE Station (BNSF Connection) Alignment Alternative
The Tracy ACE Station (BNSF Connection) alignment alternative could potentially affect at least 14 unnamed and named water resources, including (i.e., not limited to) California Aqueduct, Delta Mendota Canal, Upper Main Canal, San Joaquin River, Paradise Cut, Tom Paine Slough, Lone Tree Creek, and Avena Drain.

This alignment alternative could directly impact 48.9 ac (19.79 ha) of floodplains. In addition, 7,390 linear ft (2,252.5 m) of streams, rivers, and channels and 3.0 ac (1.21 ha) of surface water bodies could be impacted. The Tracy ACE Station (BNSF Connection) alignment alternative could directly impact 331.9 ac (134.32 ha) of groundwater and 17.2 ac (6.96 ha) of land with potentially erosive soil conditions. (See Table 3.14-1.)

The Tracy ACE Station (BNSF Connection) alignment alternative could indirectly impact 154.5 ac (62.53 ha) of floodplains. In addition, 23,468 linear ft (7,457.8 m) of streams, rivers, and channels and 13 ac (5.26 ha) of surface water bodies could be indirectly affected. This alignment alternative could indirectly impact 1,137 ac (460.14 ha) of groundwater and 70.0 ac (28.33 ha) of land with potentially erosive soil conditions. (See Table 3.14-2.)

The Tracy ACE Station (BNSF Connection) alignment alternative would be downstream of the San Joaquin River (portion from Stanislaus River to Delta Boundary), identified as TMDL impaired for the following pollutants: boron, electrical conductivity, DDT, unknown toxicity, and Group A pesticides (aldrin, dieldrin, chlordane, endrin, heptachlor, heptachlor expoxide, hexachlorocyclohexane—including lindane—endosulfan, and toxaphene), diazinon, and chlorpyrifos. Construction and operation of the HST is not a likely source of these contaminants and would not impact this impaired segment of the San Joaquin River because the segment is upstream of the alignment alternative. Any potential contaminants from the construction or operation of the HST would travel downstream, not upstream, and therefore would not affect the impaired river segment. The alignment alternative would also traverse Lone Tree Creek, identified as TMDL impaired for the following pollutants: ammonia, BOD, and electrical conductivity. Construction and operation of the HST is not a likely source of these contaminants; therefore, the HST along this alignment alternative is not expected to increase the identified contaminants in Lone Tree Creek.

Tracy ACE Station (UPRR Connection) Alignment Alternative
The Tracy ACE Station (UPRR Connection) alignment alternative could potentially affect at least 9 of the water resources identified in the Tracy ACE Station BNSF alignment alternative, excluding Lone Tree Creek, Avena Drain, and the Main Drain Canal.

This alignment alternative could directly impact 29.3 ac (11.86 ha) of floodplains. In addition, 5,433 linear ft (1,656 m) of streams, rivers, and channels and 2.1 ac (0.85 ha) of surface water bodies could be affected. The Tracy ACE Station (UPRR Connection) alignment alternative could also directly impact 205.2 ac (83.04 ha) of groundwater and 17.2 ac (6.96 ha) of land with potentially erosive soil conditions. (See Table 3.14-1.)

The Tracy ACE Station (UPRR Connection) alignment alternative could indirectly impact 76.8 ac (31.08 ha) of floodplains. In addition, 13,161 linear ft (4,011.5 m) of streams, rivers, and channels and 9.2 ac (3.72 ha) of surface water bodies could be indirectly impacted. This alignment alternative could indirectly impact 629.2 ac (254.64 ha) of groundwater and 70 ac (28.33 ha) of land with potentially erosive soil conditions. (See Table 3.14-2.)

The Tracy ACE Station (UPRR Connection) alignment alternative would be downstream of the San Joaquin River (portion from Stanislaus River to Delta Boundary), identified as TMDL impaired for the following pollutants: boron, electrical conductivity, DDT, unknown toxicity, and Group A pesticides (aldrin, dieldrin, chlordane, endrin, heptachlor, heptachlor expoxide, hexachlorocyclohexane—including lindane—endosulfan, and toxaphene), diazinon, and chlorpyrifos. Construction and operation of the HST is not a likely source of these contaminants, and would not impact this impaired segment of the San Joaquin River because the segment is upstream of the alignment alternative. Any potential contaminants from the construction or operation of the HST would travel downstream, not upstream, and therefore would not affect the impaired river segment.

Tracy Downtown (UPRR Connection) Alignment Alternative
The Tracy Downtown (UPRR Connection) alignment alternative could potentially affect at least 9 of the water resources identified in the Tracy Downtown (BNSF Connection) alignment alternative, excluding Lone Tree Creek, Avena Drain, and the Main Drain Canal.

This alignment alternative could directly impact 32 ac (12.95 ha) of floodplains. In addition, 5,484 linear ft (1,641 m) of streams, rivers, and channels and 2.3 ac (0.93 ha) of surface water bodies could be impacted. The Tracy Downtown (UPRR Connection) alignment alternative could also directly impact 241.2 ac (97.61 ha) of groundwater and 15.8 ac (6.39 ha) of land with potentially erosive soil conditions. (See Table 3.14-1.)

The Tracy Downtown (UPRR Connection) alignment alternative could indirectly impact 99.6 ac (40.31 ha) of floodplains. In addition, 15,605 linear ft (4,756.4 m) of streams, rivers, and channels and 7.6 ac (3.08 ha) of surface water bodies could be indirectly impacted. This alignment alternative could indirectly impact 812.6 ac (328.86 ha) of groundwater and 63.5 ac (25.7 ha) of land with potentially erosive soil conditions. (See Table 3.14-2.)

The Tracy Downtown (UPRR Connection) alignment alternative would be downstream of the San Joaquin River (portion from Stanislaus River to Delta Boundary), identified as TMDL impaired for the following pollutants: boron, electrical conductivity, DDT, unknown toxicity, and Group A pesticides (aldrin, dieldrin, chlordane, endrin, heptachlor, heptachlor expoxide, hexachlorocyclohexane—including lindane—endosulfan, and toxaphene), diazinon, and chlorpyrifos. Construction and operation of the HST is not a likely source of these contaminants, and would not impact this impaired segment of the San Joaquin River because the affected portion is upstream of the alignment alternative. Any potential contaminants from the construction or operation of the HST would travel downstream and not affect the impaired river.

East Bay Connections
The East Bay Connections alignment alternative would directly impact approximately 0.6 ac (0.24 ha) of floodplains and 322 linear ft (98.1 m) of streams, 30.3 ac (12.26 ha) of land with potentially erosive soil conditions, and 18.9 ac (7.65 ha) of groundwater. Indirect impacts include up to 2.3 ac (0.93 ha) of floodplains, 1,805 linear ft (550.2 m) of streams, 37.4 ac (15.14 ha) of land with potentially erosive soil conditions, and 75.8 ac (30.68 ha) of groundwater.

Station Location Options
There are no floodplains, streams, surface water bodies, or potentially erosive soils within the vicinity of the Pleasanton (I-680/Bernal) Station, Livermore (Downtown), Tracy (Downtown), and Tracy (ACE) station location options.

Pleasanton (I-680/Bernal) Station
This station location option could directly impact 10.9 ac (4.41 ha) and indirectly impact 15.6 ac (6.31 ha) of groundwater.

Pleasanton (BART) Station
There are 2.4 ac (0.97 ha) of floodplains and 438 linear ft (133.5 m) of streams, rivers, and canals that could be directly impacted by this station location option. The station location option also has the potential to impact 16.2 ac (6.56 ha) of groundwater. Indirect impacts could occur to 3.3 ac (1.34 ha) of floodplains and 538 linear ft (164 m) of streams, rivers, and channels. In addition, 21.1 ac (8.54 ha) of groundwater could also be indirectly impacted. There are no surface water bodies or land with potentially erosive soil conditions near this station location option.

Livermore (Downtown) Station
This station location option could directly impact 13.3 ac (5.38 ha) of groundwater. It could also indirectly impact 276 linear ft (84.1 m) of streams, rivers, and channels and 17.2 ac (6.96 ha) of groundwater.

Livermore (I-580) Station
This station location option would not affect surface water bodies. The station location option could directly impact 1.7 ac (0.69 ha) of floodplains. In addition, 174 linear ft (53 m) of streams, rivers, and channels could be affected. Finally, 15.9 ac (6.43 ha) of groundwater and 8.3 ac (3.36 ha) of land with potentially erosive soil conditions could be directly impacted. The station location option could indirectly impact 2.7 ac (1.09 ha) of floodplains. In addition, 23.1 ac (9.35 ha) of groundwater as well as 11.7 ac (4.73 ha) of land with potentially erosive soil conditions could be indirectly affected.

Livermore (Greenville Road/UPRR) Station
This station location option could directly impact 12.9 ac (5.22 ha) and indirectly impact 21.9 ac (8.87 ha) of groundwater.

Livermore (Greenville Road/I-580)
There are no floodplains, streams, and surface water bodies near this station location option. The station could directly impact 13.8 ac (5.59 ha) of groundwater as well as 8.2 ac (3.33 ha) of land with potentially erosive conditions. In addition, the station could indirectly impact 19.8 ac (8.01 ha) of groundwater and 11.6 ac (4.69 ha) of land with potentially erosive conditions.

Tracy (Downtown) Station
This station location option could directly impact 11.8 ac (4.78 ha) and indirectly impact 16.3 ac (6.6 ha) of groundwater.

Tracy (ACE) Station
This station location option could directly impact 15.0 ac (6.07 ha) and indirectly impact 20.3 ac (8.22 ha) of groundwater.

Summary of Impacts
As shown in Tables 3.14-1 and 3.14-2, a combination of alignment alternatives would be required within this corridor. Any combination of alignment alternatives within this corridor would have to include the East Bay Connections alignment alternative to complete the connection from the East Bay to the Central Valley. The discussion below compares the potential direct and indirect impacts of two sets of options. The Altamont Pass Options (Niles Junction to County Line) include four alignment alternatives that extend from Niles Junction to the Alameda County line. The Altamont Pass Options (County Line to Central Valley) also include four alignment alternatives that extend through Tracy to the Central Valley Corridor.

Altamont Pass Options (Niles Canyon to County Line)
The I-680/I-580/UPRR alignment alternative could potentially affect the most water resources (17) when compared with the other alignment alternatives. Nine of these water resources are also potentially affected by the I-580/UPRR, Patterson Pass/UPRR, and UPRR alignment alternatives.

Direct Impacts
As shown in Table 3.14-1, the Patterson Pass/UPRR alignment alternative would potentially impact the most area within the 100-year floodplain but the least amount of streams. This alignment alternative would have up to 5.6 more ac (2.27 ha) of floodplain impacts, primarily in the area of Arroyo Moche between Pleasanton and Livermore. This alignment alternative would be on aerial structure through most of the areas within the 100-year floodplain and would and not impede storm flows. The I-680/580/UPRR alignment alternative would have the least amount of impact on floodplains and also be on aerial structure, but would cross several watercourses for a total of approximately 2,583 linear ft (787.3m), including South San Ramon Creek, Laurel Creek, Arroyo de la Laguna, Arroyo Las Positas, and Patterson Run Canal. This alignment alternative would cross all but nine of the watercourses on aerial structure and would span the watercourse channels and embankments. While there are less floodplains and streams in the path of the I-580/UPRR and UPRR alignment alternatives compared to the Patterson Pass/UPRR and I-680/580/UPRR alignment alternatives, respectively, the I-580/UPRR alignment alternative would have the potential to impact more area of floodplain because it would be constructed at-grade through the Arroyo Gravel Pits southeast of the Livermore Municipal Airport. The I-580/UPRR alignment alternative would also potentially impact approximately 2.1 ac (0.85 ha) of the water-filled gravel pits. The UPRR alignment alternative would pass adjacent to the gravel pits but on an aerial structure with limited impact. The UPRR alignment alternative would also cross fewer watercourses than either the I-680/580/UPRR or I-580/UPRR alignment alternatives but have a greater potential impact because 13 of the watercourses would be crossed at-grade rather than spanned by aerial structure. Overall, the I-680/580/UPRR alignment alternative would have the least potential impact on floodplains, and the Patterson Pass/UPRR alignment alternative would have the least potential impact on streams. Where there is the potential to impact floodplains, alignment alternatives that are either at-grade or on embankments would be constructed with culverts sized appropriately to convey anticipated storm flows and to minimize ponding.

The Patterson Pass/UPRR alignment alternative would have up to 18 ac (7.28 ha) less of erosive soil effects than the other alignment alternatives where additional erosive soils exist in the Altamont Pass area. There would be a small increase in the amount of impervious surfaces in areas where the alignment alternatives would not be along existing transportation facilities or in developed areas, such as through the Altamont Pass or Patterson Pass; however, the HST would consist of permeable track-fill rather than impervious pavement resulting in a low runoff potential. The Patterson Pass/UPRR and UPRR alignment alternatives have the potential to encounter more groundwater east of Livermore than the other two alignment alternatives, but in these areas, much of the alignment alternative would be at-grade and the potential to encounter groundwater would be limited. For all of the alignment alternatives, there is the potential to encounter groundwater where column support footings for aerial structures would be required. Each of the alignment alternatives would have the potential to encounter groundwater as a result of tunneling under Alameda Creek, near the City of Freemont city limits and would require dewatering as part of construction and possibly during operation. Impacts on groundwater recharge would be low for all of the alignment alternatives due to the use of aerial structure for much of the length of the alignment alternatives and also due to the overall footprint of the HST. The potential for erosion due to runoff would primarily be limited to locations of erosive soil conditions through the Altamont Pass and Patterson Pass where tunnels and earthwork would be required. Overall, the Patterson Pass/UPRR alignment alternative would have the least potential to be affected by erosive soils, and the I-680/580/UPRR and I-580/UPRR alignment alternatives would have the least potential impact on groundwater.

Indirect Impacts
Potential indirect impacts from construction within this corridor would be similar to those discussed above for the San Francisco to San Jose Corridor. As shown in Table 3.14-2, the I-580/UPRR alignment alternative would potentially indirectly impact up to 17 more ac (6.88 ha) of floodplains and 7.45 more ac (3.01 ha) of surface waters than the other alignment alternatives between Niles Junction and the county line. The I-680/580/UPRR alignment alternative could indirectly impact up to 7,500 more ft (2,286 m) of streams and canals and have the highest potential to encounter erosive soil conditions and groundwater basins. The UPRR alignment alternative would have the least potential to indirectly impact 100-year floodplains and watercourses. Because of location through the Altamont Pass, the I-580/UPRR alignment alternative would have slightly less potential to encounter erosive soils compared to the other alignment alternatives. The Patterson Pass/UPRR and UPRR alignment alternatives would have the least potential indirect impact on groundwater.

TMDLs
The alignment alternatives between Niles Junction and the Altamont county line would all traverse many of the same impaired water resources; however, the I-580/UPRR and the UPRR alignment alternatives would traverse five impaired water resources. The I-580/UPRR and UPRR alignment alternatives would traverse the following TMDL impaired surface water resources: Alameda Creek, Arroyo De La Laguna, Arroyo Del Valle, Arroyo Positas, and Arroyo Mocho. These waters are impaired with diazinon. The construction and operation of the HST is not a likely source of these contaminants; therefore, the HST along these alignment alternatives is not expected to increase diazinon levels in these waters.

Altamont Pass Options (County Line to Central Valley)
The Tracy Downtown (BNSF Connection) and Tracy ACE Station (BNSF Connection) alignment alternatives could each affect 14 water resources, many the same. The Tracy Downtown (UPRR Connection) and Tracy ACE Station (UPRR Connection) alignment alternatives could affect the same 9 water resources, fewer than either the Tracy Downtown (BNSF Connection) or Tracy ACE Station (BNSF Connection) alignment alternatives. All of the alignment alternatives within this set of options cross the California Aqueduct, Delta-Mendota Aqueduct, and the San Joaquin River.

Direct Impacts
As shown in Table 3.14-1, the Tracy ACE Station (BNSF Connection) alignment alternative would potentially impact the most area within the 100-year floodplain, the most number of streams and canals, and the most area of surface waters. This alignment alternative is also the longest of the four alignment alternatives. This alignment alternative would have up to 7.5 more ac (3.04 ha) of floodplain impacts primarily in the area east of Manteca. All of the alignment alternatives would have substantial floodplain impacts around the San Joaquin River, but these alignments would also be adjacent to existing railroad corridors. The alignment alternatives would be at-grade or on embankment through most of the areas within the 100-year floodplain. The Tracy ACE Station (UPRR Connection) alignment alternative would have the least amount of impact on floodplains. Where there is the potential to impact floodplains, alignment alternatives that are either at-grade or on embankments would be constructed with culverts sized appropriately to convey anticipated storm flows and to minimize ponding. The Tracy Downtown (UPRR Connection) alignment alternative would have the least potential impact on watercourses.

Each of the alignment alternatives within this set of options would be affected by potentially erosive soils where the alignment alternatives extend east of the Altamont Pass and Patterson Pass. The Tracy ACE Station (BNSF Connection) and Tracy ACE Station (UPRR Connection) alignment alternatives would encounter up to 1.4 ac (0.57 ha) more of erosive soils than the other two alignment alternatives. There would be an increase in the amount of impervious surfaces in areas where the alignment alternatives would not be along existing transportation facilities or in developed areas, such as through the Altamont Pass or Patterson Pass. Both the Tracy Downtown (BNSF Connection) and Tracy ACE Station (BNSF Connection) alignment alternatives would have the potential to encounter more groundwater than the other two alignment alternatives, primarily due to the longer length of the alignments to the BNSF. The additional alignment length of the Tracy Downtown (UPRR Connection) and Tracy ACE Station (UPRR Connection) alignment alternatives would primarily be at-grade and the potential to encounter groundwater would be limited. For all of the alignment alternatives, there is the potential to encounter groundwater where column support footings for aerial structures would be required, such as through portions of Tracy, Lathrop, and Manteca. Impacts on groundwater recharge would be low to moderate for all of the alignment alternatives due to the overall footprint of the HST alignments. The potential for erosion due to run-off would primarily be limited to locations of erosive soil conditions around the Altamont Pass and Patterson Pass where some earthwork would be required. Overall, the Tracy Downtown (BNSF Connection) and Tracy Downtown (UPRR Connection) alignment alternatives would have the least potential to be affected by erosive soils, and the Tracy ACE Station (UPRR Connection) alignment alternative would have the least potential impact on groundwater.

Indirect Impacts
Potential indirect impacts from construction within this corridor would be similar to those discussed above for the San Francisco to San Jose Corridor. As shown in Table 3.14-2, the Tracy ACE Station (BNSF Connection) alignment alternative would potentially have substantially higher indirect impacts than the other alignment alternatives between the county line and the Central Valley. This alignment alternative would affect up to 55 more acres (22.6 ha) of 100-year floodplains, 4,800 more linear ft (1,463 m) of watercourses, 5 more acres (2.02 ha) of water bodies such as lakes, and encounter 6.5 ac (2.63 ha) more of erosive soils compared to the other alignment alternatives. The Tracy ACE Station (UPRR Connection) alignment alternative would have substantially less potential to have indirect impacts on floodplains and watercourses, and encounter the least amount of groundwater.

TMDLs
All of the alignment alternatives would all cross the San Joaquin River downstream of a TMDL impaired portion; therefore, any potential contaminants from the construction or operation of the HST would travel downstream and would not affect the impaired river segment. The Tracy ACE Station (BNSF Connection) and the Tracy Downtown (BNSF Connection) alignment alternatives would also traverse an impaired portion of Lone Tree Creek. Construction and operation of the HST is not expected to increase the contaminants identified within Lone Tree Creek.

East Bay Connections
Two segments make up the East Bay Connections alignment alternative: the north segment (Niles to Union City – Niles Wye [E] to Niles Wye [N]) and south segment (Niles to Fremont – Niles Wye [E] to Niles Wye [S]). The south segment would be the longer of the two segments and would therefore have the potential to have greater impacts. The north segment of the East Bay Connections alignment alternative would potentially impact 0.17 ac (0.07 ha) of the Alameda Creek floodplain and the southern segment would impact 0.4 ac (0.16 ha) of the floodplain of several intermittent streams. Both the north and south connection segments would encounter potentially erosive soil conditions in the area where they would connect with the alignment alternatives between Niles Junction and the Altamont county line). Both segments would be constructed on cut and fill or at-grade and would have minimal impacts on groundwater or groundwater recharge. The East Bay Connections alignment alternative would not impact any streams identified as TMDL impaired.

<u>San Francisco Bay Crossings Corridor</u>

Alignment Alternatives
Trans Bay Crossing – Transbay Transit Center and Trans Bay Crossing – 4th & King
The alignment alternatives in this corridor would extend from the Oakland Inner Harbor to the city of San Francisco, crossing San Francisco Bay.

There are no floodplains, streams, rivers or channels, groundwater, or soils with potentially erosive soil conditions within the vicinity of the transbay tube crossings; therefore, direct impacts would not occur. The transbay crossing at the Transbay Transit Center could directly impact 36.5 ac (14.77 ha) of the San Francisco Bay and indirectly impact 235.5 ac (95.31 ha). The transbay crossing at 4th and King could directly impact 35.4 ac (14.33 ha) of the San Francisco Bay and indirectly impact 228 ac (92.27 ha).

The only TMDL impaired water resources that the Trans Bay Crossing alignment alternatives could traverse are central San Francisco Bay and the Oakland Inner Harbor. Central San Francisco Bay is identified as being impaired for the following pollutants: chlordane, DDT, didieldrin, dioxin compounds (including 2,3,7,8-TCDD), exotic species, furan compounds, mercury, PCBs, PCBs (dioxin-like), and selenium. The Oakland Inner Harbor is impaired for the following pollutants: chlordane, chlordane (sediment), copper (sediment), DDT, dieldrin, dieldrin (sediment), dioxin compounds, exotic species, furan compounds, lead (sediment), mercury, mercury (sediment) PAHs (sediment), PCBs, PCBs (dioxin-like), PCBs (sediment), and selenium. Construction of these alignment alternatives is likely to disrupt Bay sediment and may disrupt any contaminants trapped in the sediment.

Dumbarton (High Bridge, Low Bridge, or Tube) Alignment Alternative

The high bridge, low bridge, or tube alignment alternatives could all potentially affect the same unnamed and named water resources, including (i.e., not limited to) tidal flats, South San Francisco Bay, Hetch Hetchy Aqueduct, Newark Slough and Salt Evaporating Ponds, and the Alameda Creek Quarries.

The high bridge, low bridge, or tube alternatives would all directly impact the same water resources. Direct impacts could include 47.4 ac (19.17 ha) of floodplains and 37.3 ac (15.10 ha) of surface water bodies. The alignment alternatives would cross 1,028 linear ft (313.3 m) of streams and canals including Hetch Hetchy Aqueduct and Newark Slough. In addition, there could be 133.7 ac (54.12 ha) of groundwater and 10 ac (4.03 ha) of potentially erosive soils directly affected. (See Table 3.14-1.)

The high bridge, low bridge, or tube alternatives could all indirectly impact the same water resources. Indirect impacts could include 162.1 ac (65.58 ha) of floodplains, as well as 143.9 ac (58.24 ha) of surface waters and 3,627 linear ft (1,105.5 m) of streams, rivers, or channels. There could be 405.9 ac (164.27 ha) of groundwater potentially indirectly impacted by the high bridge, low bridge, or tube alignment alternatives. Finally, 40.1 ac (16.24 ha) of land with potentially erosive soils could be indirectly impacted (Table 3.14-2).

The two bridge alignment alternatives and the tube alignment alternative would traverse south San Francisco Bay. The Bay is identified as being TMDL impaired for the following pollutants: chlordane, DDT, dieldrin, dioxin compounds, exotic species, furan compounds, mercury, PCBS, dioxin-like PCBs, and selenium. The construction of the bridge and tube alignment alternatives might disrupt any pollutants trapped in the sediment of south San Francisco Bay. The operation of the bridge would not be a likely source of any of the pollutants.

Fremont Central Park (High Bridge, Low Bridge, or Tube) Alignment Alternative

The high bridge, low bridge, or tube alignment alternatives would all cross the same unnamed and named water resources, including (i.e., not limited to) tidal flats, south San Francisco Bay, Hetch Hetchy, Newark Slough, Salt Evaporation Ponds, the Lagoon/Lake Elizabeth, and Mowry Slough/Mud Slough/Salt Evaporating Ponds.

The high bridge, low bridge, or tube options could all directly affect the same water resources. Direct impacts could include 71.7 ac (29.02 ha) of floodplains as well as 46.3 ac (18.74 ha) of surface water bodies and 2,041 linear ft (622.1 m) of streams, rivers, or channels. In addition, 127.7 ac (51.66 ha) of groundwater would be directly impacted. Finally, there are no potentially erosive soils in the area of these alignment alternatives. (Table 3.14-1.)

The high bridge, low bridge, or tube alternatives could all indirectly impact the same water resources. Indirect impacts could include 258.7 ac (104.69 ha) of floodplains, as well as 179.2 ac (72.52 ha) of surface water bodies and 8,301 linear ft (2,530.1 m) of streams, rivers, or channels. In addition, 450.6 ac (182.34 ha) of groundwater could be indirectly impacted. Finally, there are no potentially erosive soils in the area of these alignment alternatives. (Table 3.14-2.)

The two bridge alignment alternatives and the tube alignment alternative would traverse south San Francisco Bay. The Bay is identified as being TMDL impaired for the following pollutants: chlordane, DDT, dieldrin, dioxin compounds, exotic species, furan compounds, mercury, PCBS, dioxin-like PCBs, and selenium. The construction of these alignment alternatives might disrupt any pollutants trapped in the sediment of south San Francisco Bay. The operation of the bridge or tunnel alignment alternatives would not be a likely source of any of the pollutants.

Station Location Options

Union City (Shinn) Station

The station could directly impact 17.79 ac (7.20 ha) of groundwater and indirectly impact 22.92 ac (9.28 ha).

Summary of Impacts

There are no floodplains, streams, groundwater, or land with potentially erosive conditions related to any of the Trans Bay Crossing alignment alternatives; therefore, direct and indirect impacts would not occur. The Trans Bay Crossing — 4th and King alignment alternative would have slightly less impacts to water resources than the Transbay Transit Center alignment alternative due primarily to the length of the alignment alternative.

Potential indirect impacts from construction within this corridor would be similar to those discussed above for the San Francisco to San Jose corridor. Construction of the transbay tube for both of these alignment alternatives would potentially have significant impacts on the Bay. In addition to the USACE Section 404, RWQCB Section 401, and CDFG 1600 permits that may be required, coordination would be required with the USACE under Section 10 of the Rivers and Harbors Act and the California Coastal Commission to ensure project compliance with the California Coastal Act.

Generally, the various Dumbarton alignment alternatives could directly and indirectly impact fewer water resources than the Freemont Central Park alignment alternatives due primarily to the length of the alignment alternatives. The Dumbarton alignment alternatives impact less floodplains and fewer surface water bodies than the Freemont Central Park alignment alternatives; however, they would directly and indirectly impact slightly more acres of groundwater and land with potentially erosive soil conditions. Erosive soil conditions are found east of Mission Boulevard in Fremont. The Freemont Central Park alignment alternative would include a tunnel portion east of Freemont Boulevard and under Freemont Central Park Lake and several streams and would likely require dewatering as part of construction and possibly during operation. There is the potential to encounter groundwater where column support footings for aerial structures would be required such as through portions of Newark and Fremont. In addition to the USACE Section 404, RWQCB Section 401, and CDFG 1600 permits that may be required, coordination would be required with the USACE under Section 10 of the Rivers and Harbors Act and the California Coastal Commission to ensure project compliance with the California Coastal Act. Overall, the Dumbarton alignment alternatives would have lesser impacts on water resources as compared to the Freemont Central Park alignment alternatives. Construction of the tube for both of these alignment alternatives would potentially have significant impacts on the bay.

The Trans Bay Crossing alignment alternatives would cross central San Francisco Bay and the Inner Oakland Harbor, potentially impacting any contaminated sediment during construction. The Dumbarton and Freemont Park Central alignment alternatives would cross south San Francisco Bay, which also has contaminated sediment. Construction of any bridge or tube alternative across south San Francisco Bay has the potential to disrupt contaminated sediment.

Central Valley Corridor

Alignment Alternatives

BNSF–UPRR Alignment Alternative

This alignment alternative could potentially affect least 33 unnamed and named water resources, including (i.e., not limited to) Mormon Slough/Stockton Diverting Canal; Duck Creek; Littlejohns Creek; Avena Drain; Lone Tree Creek; Main District Canal; Stanislaus River; Hetch Hetchy Aqueduct; Lateral Numbers 6, 3, 2, and 1; Tuolumne River; Upper Lateral Numbers 2 ½ and 3; Merced River; North and South Bloom Laterals; Main Ash Lateral; Black Rascal Creek/Hesse Lateral/Medowbrook Lateral; Farmdale Lateral; Miles Creek; Owens Creek; North Slough/Mariposa Creek; El Nido; Deadman Creek; Dutchman Creek; Chowchilla River; Ash Slough and Bypass; and the Berenda Slough.

The BNSF–UPRR alignment alternative could directly impact 183.5 ac (74.26 ha) of floodplains. In addition, 8,291 linear ft (2,527.1 m) of streams, rivers, and channels and 1.5 ac (0.61 ha) of surface water bodies could be impacted. This alignment alternative could impact 576.1 ac (233.15 ha) of groundwater. (See Table 3.14-1.)

The BNSF–UPRR alignment alternative could indirectly impact 669.5 ac (270.95 ha) of floodplains. In addition, 31,632 linear ft (9,641.4 m) of streams, rivers, and channels and 6.3 ac (2.55 ha) of surface water bodies could be indirectly affected. It could also impact 2,108.1 ac (853.15 ha) of groundwater. (See Table 3.14-2.)

This alignment alternative would traverse TMDL-impaired portions of the following five surface water resources: Avena Drain, Lone Tree Creek, Stanislaus River, Tuolumne River (Don Pedro Reservoir to San Joaquin Reservoir), and the Lower Merced River (McSwain Reservoir to San Joaquin River). These surface waters are impaired for a variety of pollutants, including (i.e., not limited to) ammonia, pathogens, BOD, electrical conductivity, diazinon, Group A pesticides (aldrin, deldrin, chlordane, endrin, heptachlor, heptachlor exposide, hexachlorocyclohexane—including lindane—endosulfan, and toxaphene), mercury, and unknown toxicity. Although the construction and operation of the HST would not be a likely source of these contaminants, the Central Valley has a long history of heavy pesticide use, and depending on the binding properties of the pesticides to soil and water, sediment runoff from the construction could potentially mobilize and release additional pesticides into these water resources. The BNSF–UPRR alignment alternative would be upstream of Mormon Slough (section from Commerce Street to Stockton Diverting Channel and section from Stockton Diverting Canal to Commerce Street), which is identified as an impaired water resource for organic enrichment, low dissolved oxygen, and pathogens. The construction and operation of the HST would not be a likely source of these contaminants.

BNSF Alignment Alternative

This alignment alternative could potentially affect at least 45 number of unnamed and named water resources, including (i.e., not limited to) Mormon Slough/Stockton Diverting Canal; Duck Creek; Littlejohns Creek; Avena Drain; Lone Tree Creek; Main District Canal; Stanislaus River; Hetch Hetchy Aqueduct; Lateral Numbers 6, 3, 2, and 1; Tuolumne River; Upper Lateral Numbers 2 ½ and 3; Merced River; north and south Bloom Laterals; Main Ash Lateral; Black Rascal Creek/Hesse Lateral/Medowbrook Lateral; Farmdale Lateral; Miles Creek; Owens Creek; Hadley Lateral/Givens Lateral; Le Grand Canal; North Slough/Mariposa Creek; El Nido; the northern and southern section of

Deadman Creek; Dutchman Creek; Chowchilla River; Ash Slough and Bypass; Berenda Slough; and Berenda Creek.

This alignment alternative could directly impact 191.1 ac (77.34 ha) of floodplains. In addition, 8,398 linear ft (2,559.7 m) of streams, rivers, and channels and 1.6 ac (0.65 ha) of surface water bodies could be affected. This alignment alternative could impact 584.1 ac (236.39 ha) of groundwater. (See Table 3.14-1.)

The BNSF alignment alternative could indirectly impact 759.2 ac (307.25 ha) of floodplains. In addition, 32,594 linear ft (9,934.7 m) of streams, rivers, and channels and 6.7 ac (2.71 ha) of surface water bodies could be indirectly impacted. Finally, it could impact 2,218.9 ac (897.99 ha) of groundwater. (See Table 3.14-2.)

This alignment alternative would traverse TMDL-impaired portions of the same five surface water resources as the BNSF-UPRR alignment alternative.

UPRR N/S Alignment Alternative
This alignment alternative could affect at least 35 unnamed and named streams, rivers, creeks, channels, and canals, including (i.e., not limited to) French Camp Slough/Littlejohns Creek; Stanislaus River; Lateral Numbers 8, 6, 7, 3, 4, and 1; Hetch Hetchy Aqueduct; Tuolumne River; Upper/Lower Lateral 3; Merced River; Bear Creek/Black Rascal/Hesse Lateral; Farmdale Lateral Miles Creek; Owens Creek; North Slough/Mariposa Creek; El Nido; South Slough; Deadman Creek; Dutchman Creek; Chowchilla River; Ash Slough/Ash Slough Bypass; and Berenda Slough.

The UPRR N/S alignment alternative could directly impact 123.4 ac (49.94 ha) of floodplains. In addition, 7,547 linear ft (2,300.3 m) of streams, rivers, and channels could be impacted. Surface water bodies are not in the area, and therefore impacts would not occur. This alignment alternative could impact 606.5 ac (245.45 ha) of groundwater. There is no land with potentially erosive soils that would be directly impacted by this alignment alternative. (See Table 3.14-1.)

This alignment alternative could indirectly impact 422.7 ac (171.07 ha) of floodplains. In addition, 41,122 linear ft (12,534 m) of streams, rivers, and channels could be indirectly impacted. Surface water bodies are not in the area and therefore would not be impacted. The UPRR N/S alignment alternative could impact 2,122.8 ac (859.1 ha) of groundwater. (See Table 3.14-2.)

This alignment alternative would traverse TMDL-impaired portions of the following three surface waters: Stanislaus River, Lower; Tuolumne River (Don Pedro Reservoir to San Joaquin Reservoir); and the Merced River, Lower (McSwain Reservoir to San Joaquin River). These surface waters are impaired for a variety of pollutants, including (i.e., not limited to) ammonia, pathogens, BOD, electrical conductivity, diazinon, Group A pesticides (aldrin, deldrin, chlordane, endrin, heptachlor, heptachlor exposide, hexachlorocyclohexane—including lindane—endosulfan, and toxaphene), mercury, and unknown toxicity. Although, the construction and operation of the HST would not be a likely source of these contaminants, the Central Valley has a long history of heavy pesticide use, and depending on the binding properties of the pesticides to soil and water, sediment runoff from the construction could potentially mobilize and release additional pesticides into these water resources.

BNSF Castle Alignment Alternative
This alignment alternative could potentially affect at least 43 unnamed and named streams, rivers, creeks, channels, and canals, including (i.e., not limited to) Mormon Slough/Stockton Diverting Canal; Duck Creek; Littlejohns Creek; Avena Drain; Lone Tree Creek; Stanislaus River; Lateral Numbers 6, 3, 2, and 1; Hetch Hetchy Aqueduct; Tuolumne River; Upper Lateral Numbers 2½ and 3; Merced River; North Bloom Lateral; Gertrude Lateral; Fahrens Creek; Bear Creek/Black Rascal Creek; Doane Canal; Fairfield Canal; Miles Creek; Planada Canal; Owens Creek; Le Grand Canal; Mariposa Creek/Duck

Slough; north and south sections of Deadman Creek; Dutchman Creek; Chowchilla River; Ash Slough and Ash Bypass Canal; Berenda Slough; and Berenda Creek.

The BNSF Castle alignment alternative could directly impact 158.2 ac (64.02 ha) of floodplains. In addition, 6,965 linear ft (2,122.9 m) of streams, rivers, and channels and 1.6 ac (0.65 ha) of surface water bodies could be affected. This alternative could impact 586.1 ac (237.19 ha) of groundwater. (See Table 3.14-1.)

The BNSF Castle alignment alternative could indirectly impact 628.8 ac (254.48 ha) of floodplains. In addition, 30,371 linear ft (9,257.1 m) of streams, rivers, and channels and 6.7 ac (2.71 ha) of surface water bodies could be indirectly affected. This alignment alternative could also impact 2,220.6 ac (898.68 ha) of groundwater. (See Table 3.14-2.)

This alignment alternative would traverse TMDL-impaired portions of same six surface waters as the BNSF and BNSF-UPRR alignment alternatives.

UPRR-BNSF Castle Alignment Alternative
This alignment alternative could potentially affect at least 34 unnamed and named streams, rivers, creeks, channels, and canals, including (i.e., not limited to) French Camp Slough/Littlejohns Creek; Stanislaus River; Lateral Numbers 8, 6, 7, 3, 4, and 1; Hetch Hetchy Aqueduct; Tuolumne River; Lower Lateral Number 2; Upper/Lower Lateral Number 3; North Bloom Lateral; Gertrude Lateral; Casad Canal; Canal Creek/Livingston Canal; Fahrens Creek; Bear Creek/Black Rascal Creek; Doane Canal; Fairfield Canal; Miles Creek; Planada Canal; Owens Creek; Le Grand Canal; Mariposa Creek/Duck Slough; north and south sections of Deadmans Creek; Dutchman Creek; Chowchilla River; Ash Slough and Ash Bypass Canal; Berenda Slough; and Berenda Creek.

The UPRR-BNSF Castle alignment alternative could directly impact 97.7 ac (39.54 ha) of floodplains. In addition, 7,734 linear ft (2,357.3 m) of streams, rivers, and channels and 0.1 ac (0.04 ha) of surface water bodies could be affected. This alignment alternative could impact 593.7 ac (240.27 ha) of groundwater as well. There are no potentially erosive soils that would be directly impacted in this area. (See Table 3.14-1.)

The UPRR-BNSF Castle alignment alternative could indirectly impact 388 ac (157.02 ha) of floodplains. In addition, 43,276 linear ft (13,190.5 m) of streams, rivers, and channels and 0.4 ac (0.16 ha) of surface water bodies could be indirectly affected. This alignment alternative could indirectly impact 2,243.4 ac (907.9 ha) of groundwater as well. There are no potentially erosive soils that could be indirectly impacted in this area. (See Table 3.14-2.)

This alignment alternative would traverse TMDL-impaired portions of the following two surface water resources: Lower Stanislaus River and Tuolumne River (Don Pedro Reservoir to San Joaquin Reservoir). These surface waters are impaired for a variety of pollutants, including diazinon, Group A pesticides (aldrin, deldrin, chlordane, endrin, heptachlor, heptachlor exposide, hexachlorocyclohexane—including lindane—endosulfan, and toxaphene), mercury, and unknown toxicity. Although the construction and operation of the HST would not be a likely source of these contaminants, the Central Valley has a long history of heavy pesticide use. Depending on the binding properties of the pesticides to soil and water, sediment runoff from the construction could potentially mobilize and release additional pesticides into these water resources.

UPRR-BNSF Alignment Alternative
This alignment alternative could potentially affect least 42 unnamed and named streams, rivers, creeks, channels, and canals, including (i.e., not limited to) French Camp Slough/Littlejohns Creek; Stanislaus River; Lateral Numbers 8, 6, 7, 3, 4, and 1; Hetch Hetchy Aqueduct; Tuolumne River; Lower Lateral Number 2; Upper/Lower Lateral Number 3; upper, middle, and lower sections of Cross

Ditch Number 2; Merced River; north and south Bloom Lateral; Black Rascal Creek/Hesse Lateral/Medowbrook Lateral; Merced Lateral/Bear Creek/Black Rascal Creek; Farmdale Lateral; Miles Creek; Owens Creek; North Slough/Mariposa Creek; El Nido; South Slough; Deadman Creek; Dutchman Creek; Chowchilla River; Ash Slough and Ash Slough Bypass; and Berenda Slough.

This alignment alternative could directly impact 123.1 ac (49.82 ha) of floodplains and 9,060 linear ft (2,761.5 m) of streams, rivers, and channels. This alignment alternative could also impact 582.9 ac (235.9 ha) of groundwater as well. There are no potentially erosive soils that would be directly affected in the area. (See Table 3.14-1.)

The UPRR-BNSF alignment alternative could indirectly impact 428.7 ac (173.49 ha) of floodplains and 44,538 linear ft (13,575.2 m) of streams, rivers, and channels. This alignment alternative could also indirectly impact 2,131 ac (862.42 ha) of groundwater as well. There are no potentially erosive soils that could be indirectly affected in this area. (See Table 3.14-2.)

This alignment alternative would traverse TMDL-impaired segments of the same three surface water resources as the UPRR N/S Alignment Alternative.

Station Location Options

Modesto (Downtown) Station

There are no floodplains, streams, surface water bodies, or potentially erosive soils near this station. The station could directly impact 8.5 ac (3.44 ha) and indirectly impact 12.6 ac (5.10 ha) of groundwater.

Briggsmore (Amtrak) Station

There are no floodplains, streams, surface water bodies, or potentially erosive soils within the vicinity of this station. The station could directly impact 14.2 ac (5.75 ha) and indirectly impact 18.9 ac (7.65 ha) of groundwater.

Merced (Downtown) Station

There are no streams, surface water bodies, or potentially erosive soils near this station. The station could directly impact 11.7 ac (4.73 ha) of floodplains, as well as 11.7 ac (4.73 ha) of groundwater. In addition, the station could indirectly impact 15.3 ac (6.19 ha) of floodplains and 15.3 ac (6.19 ha) of groundwater.

Castle AFB Station

There are no floodplains, surface water bodies, or potentially erosive soils near this station. The station could directly impact 416 linear ft (126.8 m) of streams, rivers, and channels, as well as 18 ac (7.28 ha) of groundwater. In addition, the station could indirectly impact 516 linear ft (157.3 m) of streams, rivers, and channels and 23.5 ac (9.51 ha) of groundwater.

Summary of Impacts

The alignment alternatives in this corridor would either connect with the alignment alternatives from the East Bay to Central Valley corridor or the San Jose to Central Valley corridor. This corridor would also connect with the statewide system extending north to Sacramento and south to Los Angeles. The corridor is composed of variations of BNSF alignment alternatives and UPRR alignment alternatives.

The alignment alternatives within the Central Valley corridor have the potential to affect between 33 and 45 named and unnamed water resources. Many of the alignment alternatives could impact many of the same water resources. For example, the BNSF-UPRR, BNSF, and BNSF-Castle alignment alternatives all cross the same water resources with a few exceptions. Likewise, the UPRR N/S, UPRR-BNSF-Castle, and UPRR-BNSF alignment alternatives also all cross the same water resources with a few exceptions.

Direct Impacts

As shown in Table 3.14-1 and Figure 3.14-1, the BNSF-UPRR, BNSF, and BNSF Castle alignment alternatives could directly impact more area within the 100-year floodplain than the UPRR N/S, UPRR-BNSF-Castle, and UPRR-BNSF alignment alternatives. The primary difference in potential floodplain impacts between the BNSF alignment alternatives as compared to the UPRR alignment alternatives is in the area southeast of Stockton to Escalon. Within this area, BNSF alignment alternatives could potentially impact 67 ac (27.11 ha) and would be constructed primarily at-grade or on cut and fill. The UPRR alignment alternatives would also potentially impact about 7 ac (2.83 ha) of floodplain in the area around Stockton, and the alignment would be constructed on aerial structure and at-grade. The other large area of potential floodplain impacts is around Merced where the BNSF alignment alternatives could potentially affect up to 32 ac (12.95 ha) more floodplain than the UPRR alignment alternatives. Both the BNSF and UPRR alignment alternatives would be constructed primarily either at-grade or on cut and fill. Overall, the UPRR-BNSF Castle alignment alternative would have the least amount of impact on floodplains. Where there is the potential to impact floodplains, alignments that are either at-grade or on cut and fill would be constructed with culverts sized appropriately to convey anticipated storm flows and to minimize ponding.

Each of the alignment alternatives would cross the Hetch Hetchy Aqueduct, Stanislaus River, Tuolumne River, Merced River, and Chowchilla River, as well as many of the same streams and canals. The UPRR-BNSF alignment alternative would have the potential to impact up to 2,095 linear ft (638.6 m) more rivers, streams, and canals as compared to the other alignment alternatives. This is primarily due to the impacts associated with the numerous water crossings south of Turlock through Merced County where the majority of water crossings are within this corridor as shown on Figure 3.14-3. The UPRR N/S and UPRR-BNSF Castle alignment alternatives would have similar amounts of impact on watercourses, as would the BNSF-UPRR and BNSF alignment alternatives. Overall, the BNSF-Castle alignment alternative would have the least amount of potential impact on watercourses, affecting approximately 6,965 linear ft (2,122.9 m) with most of the difference between alignment alternatives being south of Turlock. The BNSF-UPRR, BNSF, and BNSF-Castle alignment alternatives would impact up to 1.6 ac (0.65 ha) of water bodies, primarily associated with agriculture.

With each of the alignment alternatives, there would be a small increase in the amount of impervious surfaces in areas where the alignment alternatives would not be along existing transportation facilities or in developed areas; however, the HST would consist of permeable track-fill rather than impervious pavement resulting in a low runoff potential. Each of the alignment alternatives would have the potential to encounter groundwater because the whole Central Valley is underlain by groundwater. The UPRR N/S alignment alternative would have the potential to encounter the most groundwater due to its longer length, and the BNSF-UPRR alignment alternative the least because it is the shortest in length of the alignment alternatives. All of the alignment alternatives within this corridor would primarily be constructed at-grade, on cut and fill, or on embankment with some aerial structures and the potential to encounter groundwater would be limited. Where are aerial structures are proposed, there is the potential to encounter groundwater where column support footings would be required. Impacts on groundwater recharge would be low to moderate for all of the alignment alternatives due to the overall footprint of the HST Alignment Alternatives. The potential for erosion due to runoff would primarily be limited to locations where earthwork would be required, such as near the river crossings. Overall, the BNSF-UPRR alignment alternative would have the least potential impact on groundwater.

Indirect Impacts

The findings for indirect impacts are similar to what was discussed above regarding direct impacts. As shown in Table 3.14-2, the BNSF alignment alternative would have the potential to indirectly impact up to 370 more acres (149.74 ha) of floodplains than the UPRR-BNSF Castle alignment alternative. The UPRR-BNSF alignment alternative would affect up to 14,000 more linear ft (4,267.2

m) of watercourses compared to the BNSF Castle alignment alternative. Like direct impacts, the BNSF alignment alternatives would have the potential to indirectly affect water bodies. Each of the alignment alternatives would have the potential to indirectly impact groundwater, but as noted above, the alignment alternatives would primarily be constructed at-grade, on cut and fill, or on embankment with some aerial structures, and the potential to encounter groundwater would be limited.

TMDLs

The BNSF-UPRR, BNSF, and BNSF Castle alignment alternatives would each traverse the same six TMDL-impaired water resources and they would all be upstream of the Mormon Slough, also an impaired water resource. The UPRR N/S and UPRR-BNSF alignment alternatives could traverse the same three surface water resources. Although none of the alignment alternatives are expected to contribute to the impairments of these waters, the waters are impaired for Group A pesticides, and based on the binding properties of the pesticides to soil and water, any sediment runoff from the construction of the HST could potentially mobilize and release additional pesticides into the water resources.

3.14.4 Role of Design Practices in Avoiding and Minimizing Effects

The Authority is committed to utilizing existing transportation corridors (existing railroad or highway right-of-way) in the proposed HST system in order to minimize potential impacts to biological resources bisecting sensitive areas and creating new crossings or encroachments on water resources. Use of existing transportation corridors helps minimize potential impacts because they have already imposed a footprint/crossing that the HST alignment alternatives would expand. Moreover, portions of the system would be in tunnel or on aerial structure, which would avoid and/or minimize impacts to surface water resources.

The Authority has striven to avoid water resources throughout the extensive alignment studies leading to and including this program-level study. In addition, the Authority is committed to continuing avoidance and minimization of potential impacts during subsequent project-level analysis; however, it is unavoidable that many streams and water resources would be crossed with the proposed Bay Area to Central Valley HST Alignment Alternatives. Therefore, during project-level studies, the Authority would work closely with the regulatory agencies to develop acceptable specific design and construction standards for stream crossings, including (i.e., not limited to) maintaining open surface (bridged versus closed culvert) crossings, infrastructure setbacks, erosion control measures, sediment controlling excavation/fill practices, and other BMPs.

There is also potential for impacts to groundwater in areas of the system where tunneling or substantial excavation would be necessary. For the portions of the HST alignment alternatives in tunnel, geologic exploration, including groundwater sampling, would be completed prior to constructing the proposed tunnels. The geologic/soils/groundwater conditions would be evaluated prior to and monitored during construction to aid in the development of construction techniques and measures to minimize effects to ground- and surface water resources. Based on available geologic information and previous tunneling projects in proximity to proposed tunnels, the Authority plans to fully line tunnels with impermeable material to prevent infiltration of ground- or surface waters. Infiltration of ground and surface waters into tunnels is undesirable for operations and maintenance reasons and increases the potential for adverse impacts to ground and surface waters. All reasonable measures would be taken to avoid water infiltration. In addition, it is assumed that tunnel boring machines would be appropriately equipped with shielding to minimize the infiltration of higher pressure groundwater during the boring process.

3.14.5 Mitigation Strategies and CEQA Significance Conclusions

Based on the analysis above, and considering the sophisticated design, engineering, and construction practices that would be used (and required in order to obtain permits), each of the proposed HST

Alignment Alternatives would have a potentially significant impact on hydrology and water quality in the study area. Placing the HST alignment alternatives within or along existing transportation corridors reduces the potential for adverse effects to these water resources, and engineering and design practices further reduce potential adverse impacts to these water resources (e.g., avoiding encroachments on water resources, use of tunnels lined with impermeable surfaces, infrastructure setbacks from surface waters, and using permeable surfaces and structures to reduce flow and drainage obstructions). Additional avoidance and mitigation strategies, as well as the design practices, would be applied to reduce these impacts in the second-tier, project-level analyses and in obtaining permits for facilities included in the HST system.

Proposed general mitigation strategies would be fairly similar for all HST Alignment Alternatives. These strategies are described as general policies that could be adopted and developed in detail at the project-specific level of environmental analysis. First, measures designed to avoid or limit impacts would be considered. If avoidance measures are not feasible, then mitigation measures directed at reconstruction, restoration, or replacement of the resource, in close coordination with state and federal resource agencies, would be considered as part of subsequent project planning, environmental review, and design. Potential mitigation strategies are listed below.

A. FLOODPLAINS

Mitigation for potential impacts on floodplains would include consideration of the following strategies.

- Avoid or minimize construction of facilities within floodplains where feasible.
- Minimize the footprint of facilities within floodplains through design changes or use of aerial structures.
- Restore the floodplain to be equivalent to its prior function in instances where the floodplain is affected by construction.

B. SURFACE WATERS, RUNOFF, AND EROSION

Mitigation strategies for potential impacts on surface waters would include consideration of the following.

- As part of the future project-level analysis, conduct studies and evaluate potential alteration in coastal hydrology/hydraulics in tidal lagoons, bays, and marshes from specific construction methods or facility designs. Construction methods or facility designs to minimize potential impacts would be considered and used to the extent feasible.
- Permit requirements as part of project-level review would include SWPPPs and NPDES permits. The SWPPP would include BMPs to minimize potential short-term increases in sediment transport caused by construction, including erosion control requirements, stormwater management, and channel dewatering for all stream and lake crossings. Regional NPDES permit requirements would be followed and BMPs, as required for new developments, would be implemented. These may include measures to provide permeable surfaces where feasible and to retain and treat stormwater on site using catch basins and treatment (filtering) wet basins. Other measures to manage the overall amount and quality of stormwater runoff to regional systems would be detailed as part of SWPPP.
- Apply for and obtain appropriate permits under Sections 404 and 401 of the Clean Water Act and comply with mitigation measures required in the permits. Other mitigation measures may include habitat restoration, reconstruction on site, or habitat replacement off site to compensate for loss of native habitats and wetlands. The ultimate goal of the mitigation would be to ensure minimal impact on surface water quality.

- Under the requirements of the NPDES Caltrans Statewide Storm Water Permit and the Construction General Permit, a SWPPP would be developed during construction and implemented to reduce pollutants in stormwater discharges and the potential for erosion and sedimentation.
- Implement BMPs which would include:
  - Practices to minimize the contact of construction materials, equipment, and maintenance supplies with stormwater.
  - Practices to reduce erosion of exposed soil, including soil stabilization, watering for dust control, perimeter silt fences, placement of rice straw bales, and sediment basins.
  - Practices to maintain water quality, including infiltration systems, detention systems, retention systems, constructed wetland systems, filtration systems, biofiltration/bioretention systems, grass buffer strips, ponding areas, organic mulch layers, planting soil beds, sand beds, and vegetated systems (biofilters) such as vegetated swales and grass filter strips that are designed to convey and treat either shallow flow (swales) or sheetflow (filter strips) runoff.
- Work around various surface water bodies would be required to follow CWA Sections 401 and 404 and applicable permit requirements.
- Follow requirements of Section 10 of the Rivers and Harbors Act if work is required around a water body, such as the crossing of the San Francisco Bay, designated as navigable and applicable permit requirements.
- Work along the banks of various surface water bodies would require an application for a CDFG Section 1600 Lake or Streambed Alteration Agreement.
- Implement a spill prevention and emergency response plan to handle potential fuel or other spills.
- Incorporate biofiltration swales to intercept surface runoff.
- Where feasible, avoid significant development of facilities in areas that may have substantial erosion risk, including areas with erosive soils and steep slopes.

C. GROUNDWATER

Mitigation to reduce potential impacts from construction and operation of project components on groundwater discharge or recharge would include consideration of the following strategies.

- As part of the future project-level analysis, minimize development of facilities in areas that may have substantial groundwater discharge or affect recharge.
- Apply for and obtain waste discharge requirements, where needed (e.g., for dewatering), as part of project-level review.
- As part of the future project-level analysis, develop facility designs that are elevated, or at a minimum are permeable, and would not affect recharge potential where construction is required in areas of potentially substantial groundwater discharge or recharge.
- Apply for and obtain a SWPPP under NPDES permit requirements for grading, and describe BMPs that would control release of contaminants near areas of surface water or groundwater recharge (include constraining fueling and other sensitive activities to alternative locations, providing drip pans under some equipment, and providing daily checks of vehicle condition).
- Include consideration of use and retention of native materials with high infiltration potential at the ground surface in areas that are critical to infiltration for groundwater recharge.

The above mitigation strategies, which include further study leading to refinement of site-specific mitigation measures and BMPs, are expected to substantially lessen or avoid impacts to hydrology and water quality. At the second-tier, project-level review, applications of these mitigation strategies are expected to reduce impacts to hydrology and water quality to a less-than-significant level. Additional environmental assessment would allow more precise evaluation in the second-tier, project-level environmental analyses.